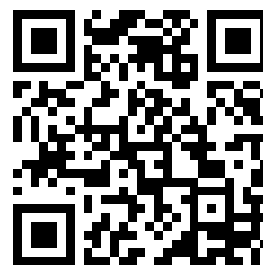

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H. O. Pub. 42
(Formerly No. 141B)

SAILING DIRECTIONS for THE BALTIC

Volume I

Store Bælt, Lille Bælt, and coast from Denmark
to Kap Arkona

First Edition
1958

Published by the U. S. Naval Oceanographic Office
under the authority of the Secretary of the Navy



United States
Government Printing Office
Washington : 1958

For Sale by authorized Sales Agents of the U. S. Naval Oceanographic Office
Price, including ring binder.....\$4.50
Contents only (without binder).....\$3.00

Change 6

HOW TO KEEP THIS BOOK CORRECTED

As initially published, this book contains material based upon information available in the U.S. Naval Oceanographic Office through the date given in the preface. Subsequently it should be brought up to date by replacing obsolete pages with loose-leaf change pages, which are published at appropriate intervals in consecutively numbered sets called Changes. A later Change does not automatically cancel an earlier Change, therefore each Change must be inserted in sequence as published; eventually the book will contain change pages from several different Changes. A revised List of Effective Pages included in each Change lists the correct pages comprising the complete book. The publication of new Changes, which normally occurs every twelve to eighteen months, is announced in Notice to

Mariners. Instructions for ordering Changes will be found in the front part of the book.

In the interval between Changes, information that may amend material in this book is published in the weekly Notice to Mariners. The Notice to Mariners number and paragraph number should be marked on applicable pages, as indicated by the page number at the end of each paragraph. This information should also be recorded on the Chart/Publication Correction Record Cards (NHO 5610/2) for the affected pages. The Notice to Mariners should be kept intact and reference made to it as required. Book owners will be placed on the Notice to Mariner mailing list on request to the U.S. Naval Oceanographic Office, Washington, D.C. 20390.

PREFACE

This publication, *Sailing Directions for the Baltic*, Volume I, is the first edition of Oceanographic Office Publication No. 42 (formerly No. 141B); as originally published it is corrected to March 22, 1958 (including Notice to Mariners No. 12). The geographic area covered in this volume formerly comprised a part of the 4th edition (1952) of H.O. Publication No. 141, *Sailing Directions for the Baltic Volume I*.

The principal sources examined in the preparation of this edition are:

Baltic Pilot, Volume I, Admiralty, London, 1944, and supplement No. 6, 1956.

Den Danske Lods, I Del, Kobenhavn, 1941.

Den Danske Lods, III Del, Kobenhavn, 1954, and supplement No. 3, 1957.

Den Danske Havnelods, Kobenhavn, 1951.

Handbuch fur Belte und Sund, Hamburg, 1943, and supplement of 1955.

Verzeichnis der Leuchfeuer und Signalstellen, Hamburg, Tiel I and II, 1956.

Appendix to *Lloyds Register*, London, 1956/57.

United States consular reports.

Various intelligence studies and port handbooks.

Reports from U.S. naval and merchant vessels.

Charts and various documents in the possession of the department.

EXPLANATORY REMARKS

Coastal descriptions.—Beginning with chapter 2, chapters in this publication are divided into major divisions, or parts, consisting of relatively short sections of coast or of bays or gulfs, islands or island groups, sounds and channels, etc. Major divisions are normally arranged in geographic sequence according to the general plan of the book, and are subdivided, according to subject, into subordinate divisions, which are arranged in the order the various subjects would normally be considered by vessels operating in the area. For example, information normally required for navigating in the

offing is given before that required for navigating close inshore, and outer dangers are described before those that fringe the coast. This arrangement makes reference to only the first few paragraphs of each major division covering a particular coast necessary for normal offshore navigation, but progressively more study of the text is required as concern for coastal details increases, as when approaching close-to, entering port, or anchoring. The subordinate divisions are appropriately titled to aid in locating specifically required information, and their arrangement is designed to eliminate comprehensive reading if the various inshore details of a coast are of no concern.

Graphic Indexes.—A general index diagram showing the area described in this publication and the general limits of the various chapters is located in the front part of the book. An individual chapter index diagram showing an enlargement of the specific area described is located at the beginning of each chapter. These chapter indexes also show the limits of the best-scale charts issued to U.S. naval vessels by the Oceanographic Office and indicate the place in the text where a description of various designated localities begins. To find the description of a particular locality, simply refer to the general index to determine the appropriate chapter, and then refer to the particular chapter index, which will indicate by means of section numbers the place in the text where a description of the area that includes the particular locality begins.

Bearings are true, and are expressed in degrees from 000° (north) to 360°, measured clockwise. Bearings limiting light sectors are toward the light.

Courses are true, and are expressed in the same manner as bearings. The directives "steer" or "make good" a course mean, without exception, to proceed from a point of origin along a track having the identical meridional angle as the designated course. Vessels following the directives must allow for every influence tending to cause deviation from such track, and navigate so that the

PREFACE

designated course is continuously being made good.

Distances are expressed in nautical miles of 1 minute of latitude, or approximately 2,000 yards. Distances of less than 1 mile are expressed in yards or fractions of a mile. Decimals are occasionally used.

Wind directions are the true directions from which winds blow.

Current directions are the true directions toward which currents set.

Charts shown on the graphic indexes at the beginning of each chapter are the largest-scale charts of the locality on issue to United States naval vessels by the Oceanographic Office. The H.O. Index Catalog of Nautical Charts and Publications shows complete Oceanographic Office chart coverage.

Geographic positions given at intervals throughout the text are approximate only and are intended to facilitate reference to the charts.

Depths are referred to chart datum and are expressed in fathoms or feet.

Heights are referred to the plane of reference used for that purpose on the charts and are expressed in fathoms or feet and meters.

Light and fog signal characteristics are not described, and light sectors are not usually defined. The Light Lists should be consulted for complete information.

Radio navigational aids and radio weather services are not described in detail. H.O. Publications Nos. 117A and 118 (formerly Nos. 205 and 206, respectively) should be consulted.

Geographic names are generally those used by the nation having sovereignty. Names in parentheses following another name are alternate or obsolete names that may appear on some charts. In general, alternate or obsolete names are quoted only in the principal description of the place.

Corrective information.—It is requested that the U.S. Naval Oceanographic Office, Washington, D.C. 20390, or any of its branch offices, be advised of any inaccuracy found in this publication or of additional navigational information considered appropriate for insertion. Various Oceanographic Office forms are available for this purpose.

Short Corrections.—Short corrections, formerly used to maintain this publication, are now being incorporated in the change pages to eliminate hand corrections by the user. If short corrections are found to be necessary in the future, a page of instructions for their use will be furnished at the time of publication.

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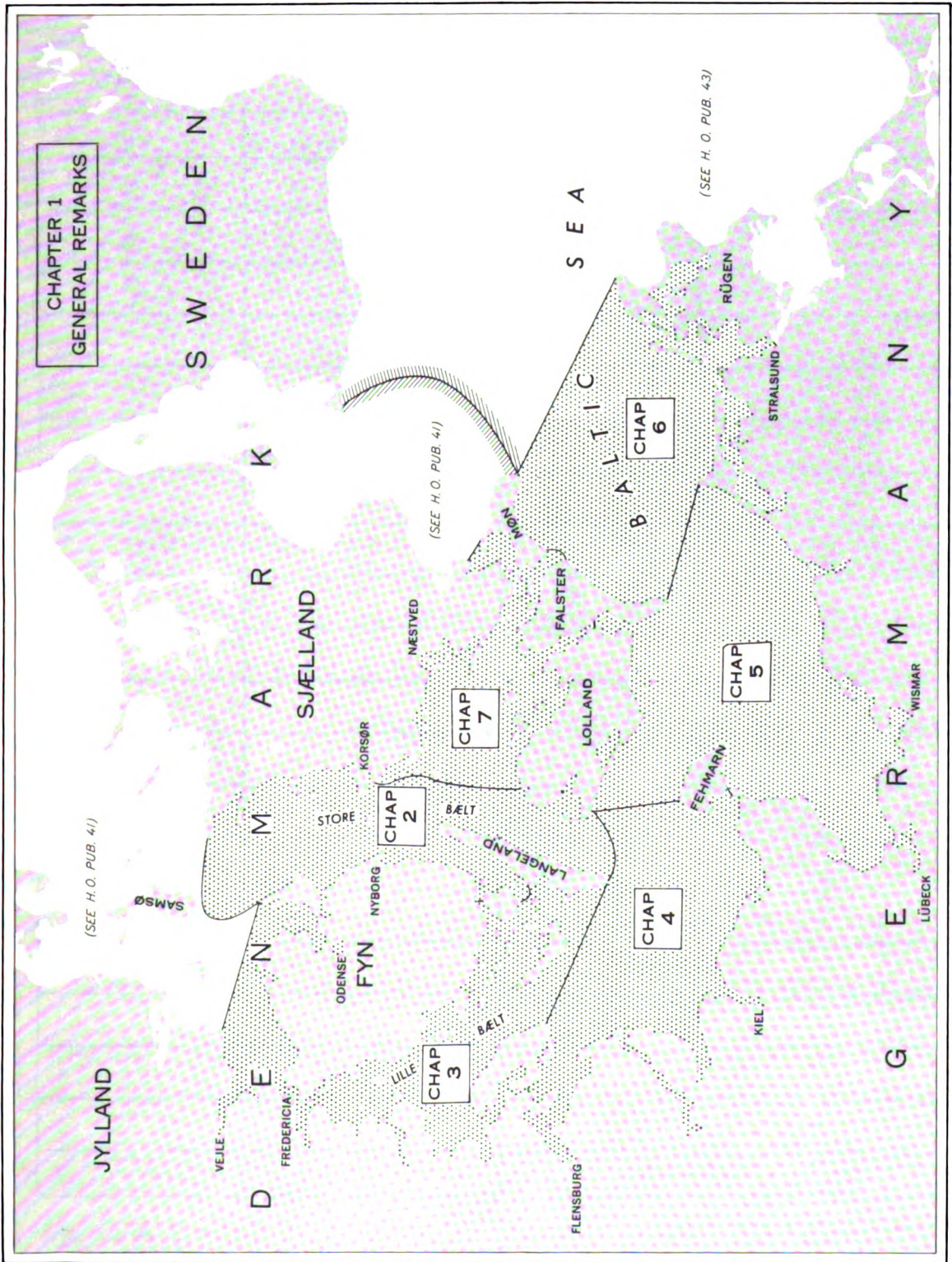
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RECORD OF CHANGES TO H. O. PUB. 42 FIRST EDITION, 1958

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HOW TO OBTAIN CHANGES

Sales to General Public.—When this book is sold, all Changes in effect at the time are furnished at no extra cost. Subsequent Changes have a standard selling price of \$1.75 each. Whenever possible, Changes should be bought from one of the local sales agents listed in Part I of the Catalog of Nautical Charts and Publications. If there is no sales agent available, Changes may be ordered by mail from the U.S. Naval Oceanographic Office, Washington, D.C., 20390 or from either of the Distribution Centers listed below. Such orders must be accompanied by check or money order made payable to the U.S. Naval Oceanographic Office. Postage stamps or Government Printing Office coupons cannot be accepted as payment. Changes will be mailed, postage paid, by regular mail. Special handling costs, such as air mail, special delivery, etc. must be borne by the purchaser.

In emergencies, Changes may be bought from one of the Branch Oceanographic Offices also listed in the catalog. Branch Offices do not handle mail orders.

Official U.S. Government Issues.—U.S. naval vessels and government activities on official distribution lists will receive Changes automatically upon publication. Government

activities not on the distribution lists should submit requests to the U.S. Naval Oceanographic Office, Washington, D.C., 20390 or to one of the Distribution Centers.

Mail orders from the Pacific Ocean area or west of the Mississippi River, except the Gulf of Mexico and the Canal Zone, should be sent to:

U.S. Naval Oceanographic Distribution
Center
Clearfield, Utah 84016

Orders from all other areas should be sent to:

U.S. Naval Oceanographic Distribution
Center
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H. O. 42—Change 8 XI

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LIST OF EFFECTIVE PAGES

H.O. Pub. No. 42 — First Edition, 1958
Change No. 8

This list supersedes any previous list. If two or more Changes are to be applied at one time, only the latest list should be used.

EXPLANATION

- 19 Original book page. Only odd-numbered pages are listed; their reverse sides are taken for granted unless otherwise noted.
- 19-3 Change page from Change No. 3. It replaces previously effective page 19.
- 20a-3 Additional book page included in Change No. 3. Pages 20b, 20c, etc., if included, are inserted in alphabetical order.

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Continued on reverse side

LIST OF EFFECTIVE CHANGES

This list supersedes any previous list. The effective pages of each listed Change must be applied to bring this publication up to date. Previous Changes not listed are no longer effective.

Change Nos. 5 and 6 have been cancelled by this Change.

Change No. 7, corrected through Notice to Mariners 1 of 4 Jan. 1969
Change No. 8, corrected through Notice to Mariners 26 of 3 July 1971

LIST OF EFFECTIVE PAGES

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**RECORD OF APPLICABLE NOTICE TO MARINERS PARAGRAPHS
BY AFFECTED PAGES**

This record may be maintained during the interval between consecutive Changes to provide a ready method of locating the Notice to Mariners paragraphs affecting the pages to be used during a voyage.

SUGGESTED USE

a. Note the latest Notice to Mariners through which this publication is corrected. The date and Notice number are indicated on the List of Effective Pages. A new record will be furnished with each change and the old record may be discarded.

b. From the List of Publications affected, which is included in Section I of each Weekly Notice to Mariners, enter the week, year, and paragraph number of all Notice to Mariners paragraphs subsequent to the date in paragraph (a) above, abreast each affected page as follows:

Page	NM	NM	NM	NM
262	41/67(4689)	18/68(2750)	31/68(4790)	43/69(6780)

c. For most pages enough columns are normally provided for entries between successive Changes.

d. A few volumes of Sailing Directions contain "a" pages (i.e. 152a). For such pages record the Notice to Mariners paragraph number with the preceding page number (i.e. 152). When correcting the text, however, read and correct the "a" pages.

e. Prior to use of this publication, inspect the Table of Contents, text, and indices for the area of operations and carefully note those pages which might be used. Such pages should then be appropriately corrected or annotated for all information contained in the Notice to Mariners paragraphs recorded abreast specific page numbers in the record. As with charts, only those pages actually used or referenced need be corrected.

f. If more than one volume of Sailing Directions is maintained, the Record of Applicable Notice to Mariners pages may be removed from each volume and inserted, collectively, in a loose-leaf binder. The Notice to Mariners paragraphs may then be entered for all Sailing Directions without recourse to each individual volume.

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CHAPTER 1

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CHAPTER 1

~~GENERAL REMARKS—BUOYAGE—SIGNALS—PILOTAGE—REGULATIONS—CAUTIONS—~~ ~~OCEANOGRAPHY—CLIMATOLOGY~~

GENERAL REMARKS

1-1 This publication contains a description of Store Bælt, Lille Bælt, the fairways south of Fyn, Smaalands Farvandet, the western part of the Baltic Sea between Pøls Huk and Kap Arkona, and the coasts of Denmark and Germany contiguous to these waters. The sequence of the description is from north to south in Store Bælt and Lille Bælt and from west to east in the Danish waters south of Fyn and Sjælland and in the Baltic Sea.

STORE BÆLT

Store Bælt is the strait between Sjælland and Lolland on the east and Fyn and Langeland on the west. It is the middle one of the three passages that connect the Kattegat with the Baltic Sea. The eastern and western passages are respectively The Sound and Lille Bælt; the former is described in H. O. Pub. No. 41.

The northern entrance of Store Bælt is between Røsnæs and Fyns Hoved. The southern entrance is between the southwestern extremity of Lolland and Gulstav, the southern end of Langeland. In the central part of the passage the island of Sprogø divides the fairway into two channels, Østerrenden and Vesterrenden, both of which are navigable by large vessels. The part of Store Bælt lying eastward of Langeland is known as Langelands Bælt. The western part of Store Bælt extends southward between the northern half of Langeland and the southeastern part of Fyn;

from the southern end of this passage channels lead through the waters south of Fyn.

The depths in most parts of Store Bælt vary considerably. Dybe Rende, a vein of deep water in which the depths exceed 15 fathoms except in a few places, runs in a winding course throughout the length of Store Bælt and is a useful guide for vessels in thick weather. During clear weather a vessel can proceed through Store Bælt in depths of not less than 7 fathoms without following Dybe Rende in all parts of the passage.

The bottom in Store Bælt is mainly clay and affords good holding ground in most places. Some of the clay bottom is covered with sand or gravel, and sand and weed is found near the shore. There are rocks and stones on many of the shoals and patches.

LILLE BÆLT

1-2 Lille Bælt, the waterway between Fyn and Ærø on the east and Jylland and Als on the west, is the westernmost and the longest of the passages connecting the Kattegat with the Baltic Sea. The northern entrance is between Bjørnsknude, on Jylland, and Æbelø, off the north coast of Fyn. The southern entrance is between Pøls Huk, on Als, and Vejsnæs Nakke, on Ærø.

The width of Lille Bælt varies considerably, and the coasts on both sides are indented by a number of fjords and bays. The northern part of the passage is narrow and winding; the central part contains several islands and is encumbered by detached shoals and fairly ex-

tensive shorebanks; and the southern part is relatively wide and has few dangers. A bridge with a vertical clearance of 108 feet crosses Lille Bælt near its narrowest part.

The depths in the main fairway through Lille Bælt vary from about 6 to 44 fathoms. The most difficult portion of this fairway to navigate is the narrow channel passing southward of Baagø, in the central part of the passage. There are several secondary channels available for small vessels.

The bottom in Lille Bælt consists mostly of clay overlaid with sand, mud, and gravel; it affords good holding ground. Sand and stones are found on the detached shoals and on the shorebanks.

Fairways south of Fyn.—The greater part of the area between the south coast of Fyn and the islands of Ærø and Langeland is occupied by extensive shoals on which are numerous islands and islets. A fairway with a least depth of $22\frac{1}{2}$ feet leads close along the south coast of Fyn and connects Lille Bælt with Store Bælt. Other fairways, which are suitable only for small vessels, lead from Lille Bælt and Store Bælt to the Baltic Sea, and shallow channels lead to several small ports in the area.

The ports of Svendborg and Rudkøbing and their approaches from Store Bælt are described with Store Bælt in chapter 2 of this publication. The remainder of the area is described with Lille Bælt in chapter 3.

SMAALANDS FARVANDET

1-3 Smaalands Farvandet is the body of water lying between Sjælland on the north and Lolland and Falster on the south. Its western limit is an imaginary line drawn from Korsør, on Sjælland, to Klinteodde, on Lolland. It is entered from Store Bælt through several channels and is connected with the Baltic Sea by the passages between Sjælland and Møn, Møn and Falster, and Falster and Lolland. Much of Smaalands Farvandet is occupied by extensive shoal areas on which are several islands.

Agersø Sund and Omø Sund, the northern entrances from Store Bælt, have depths of over 10 fathoms; the other western entrances can be used only by small vessels. In the fairways from the western entrances the depths decrease eastward and southeastward. The principal ports on the south coast of Sjælland, the north coast of Lolland, and the west and north coasts of Falster can be reached from Store Bælt in least depths of 14 to 23 feet.

The Baltic entrances of the passages between Sjælland and Møn and between Falster and Lolland are navigable only by small vessels. The least depth in the fairway of the passage between Møn and Falster is 16 feet at the eastern entrance.

WESTERN PART OF THE BALTIC SEA

1-4 The part of the Baltic Sea that is described in this volume lies between the Danish islands of Als, Ærø, Langeland, Lolland, Falster, and Møn on the north, and the German coast between Flensburg Fjord and Kap Arkona on the west and south. Between the islands on the northern side are the southern entrances of Lille Bælt, the shallow channels between Ærø and Langeland, Store Bælt, and Guldborg Sund; and the eastern entrance of Grønsund.

Kieler Bucht is that portion of the Baltic Sea lying westward of Fehmarn and Fehmarnbelt. Flensburg Fjord, through which runs the Danish-German boundary, is entered from the northwestern part of Kieler Bucht. There is also access to the fjord from northward through Als Fjord and Als Sund. The Schlei, a narrow inlet, extends in a general southwesterly direction from the southern side of the entrance of Flensburg Fjord. In the southwestern part of Kieler Bucht are Eckernförder Bucht and Kieler Förde; the Baltic terminus of the Nord-Ostsee Kanal is located on the western side of the latter inlet. Hohwacht Bucht is situated in the southeastern part of Kieler Bucht.

The island of Fehmarn, on the eastern side of Kieler Bucht, lies near the German mainland

and is separated from it by Fehmarnsund. Fehmarnbelt is the passage between Fehmarn and Lolland.

Mecklenburger Bucht is the large bay between Fehmarn and Darsser Ort, on the German mainland. In the southwestern part of this bay are Lübecker Bucht and Neustädter Bucht; at the head of Lübecker Bucht is the mouth of the Trave River. The northern terminus of the Elbe-Trave Kanal is located at Lübeck, on the Trave River. The boundary between West Germany and East Germany reaches the coast close eastward of the Trave River entrance. Wismar Bucht lies immediately eastward of Lübecker Bucht. The Warnow River flows into Mecklenburger Bucht about midway between Wismar Bucht and Darsser Ort.

Eastward of Darsser Ort the mainland coast is the northern side of Zingst peninsula. Southward of this peninsula there is a chain of connected shallow bays. Rügen, a large, irregularly shaped island that terminates northward in Kap Arkona, is separated from the mainland by a relatively narrow passage. There are several connected inland bays in the northern part of this island. Entrance to these bays is from westward. Hiddensee, a long, narrow island, lies off the northwestern side of Rügen.

The general depths in the greater part of the Baltic Sea area described in this publication are from 5 to 16 fathoms.

DENMARK

1-5 Denmark consists of the peninsula of Jylland, approximately 500 islands and islets lying between that peninsula and Sweden, and the island of Bornholm. In all it covers an area of 16,569 square miles. The Færoe Islands and Greenland are integral parts of the Danish Realm. Of the islands between the Jylland peninsula and Sweden, Sjælland is the largest, followed in order of size by Fyn, Lolland, Falster, Langeland, and Møn.

Most of this densely populated country is less than 300 feet above sea level and some parts are below sea level. Level and gently rolling surfaces predominate in the western and northern parts of Jylland, northern Fyn, most of Sjælland, Lolland, Falster, and the rest of the Danish islands. However, coastal cliffs are found in northern Sjælland and at Stevn on Møn. The east coast of Jylland is low and sandy, and is backed by gently rolling hills, some of which are as much as 200 feet high. Of the European countries, Denmark is one of the most extensively cultivated lands. About 80 percent of the country is devoted to agricultural pursuits.

Limfjorden separates northern Jylland from the remainder of the peninsula of Jylland. This fjord provides access to small vessels between the Kattegat and the North Sea. Several other fjords indent the east coast of Jylland and several of the larger islands.

The Gudenaa, the largest river in Denmark, is about 98 miles long. It drains the Silkeborg lakes region and follows a winding course to discharge into Randers Fjord.

Yding Skovhøj, 568 feet high, is the highest elevation in Denmark. This hill is located about 20 miles southwestward of the port of Aarhus.

København is the capital, principal port, and the largest city in Denmark.

Government.—Denmark is a hereditary limited monarchy. The executive power is vested in the King who exercises his authority through his ministers. The legislative authority rests jointly with the King and the Folketing (Diet). The judicial power is exercised by the courts. For administrative purposes, the country is divided into 22 amter (counties), each of which is administered by a governor.

Population.—The population of Denmark according to the 1960 census was about 4,585,000.

Ports.—The principal Danish ports in the area described in this publication are Kalundborg, Korsør, Nyborg, Svendborg, Odense, Vejle, and Fredericia.

Industry and products.—Agriculture is one of the main pursuits. The chief agricultural products are wheat, barley, oats, rye, cheese, butter, beef, veal, and pork. Although Denmark has few industrial raw materials, manufacturing is on an increase. Iron founding and the manufacture of engines, electrical machinery, footwear, and textiles are the principal industries. The country is extensively engaged in commerce and transportation. The chief exports are meat, dairy and poultry products, and machinery. The chief imports are fuels, lubricants, textile fibers, yarns, and fabrics.

Communications.—Denmark has all the modern communication facilities that could be expected of an advanced nation. Some of the islands are connected by railroad and highway bridges. There is ferry service between many of the islands and to Sweden and Germany. Hard-surfaced roads lead to the principal towns and cities. There is international communication by cable, radio, telephone, and air.

Holidays.—The general holidays in Denmark are New Year's Day, Maundy Thursday, Good Friday, Easter Monday, May 1 (Labor Day), May 5 (Liberation Day), Prayers Day (variable), Ascension Day, Whitmonday, June 5 from noon (Constitution Day), December 25, and December 26.

Standard time.—The standard time is that of the meridian of 15° E., or 1 hour fast of Greenwich mean time.

Currency, weights, and measures.—The monetary unit in Denmark is the krone of 100 øre. Coins in circulation are 1 øre, 2 øre, 5 øre, 10 øre, 25 øre, 1 krone, and 2 kroner. Notes are issued in denominations of 5 kroner, 10 kroner, 50 kroner, 100 kroner, and 500 kroner.

The metric system of weights and measures is in effect in Denmark.

GERMANY

1-6 Germany is the largest nation in central Europe. The greater part of the country is flat. Throughout the northern section few elevations rise above the coastal plain bordering the North Sea, Denmark, and the Baltic Sea. In the south there are uplands and several mountain ranges. Zugspitze, in the Bavarian Alps, has a height of 9,719 feet and is Germany's highest peak. The principal rivers are the Rhine, the Ems, the Weser, and the Elbe, which flow into the North Sea; the Oder, which flows into the Baltic Sea; and the Danube, which flows through central and southeastern Europe to the Black Sea.

The country is partitioned between West Germany (German Federal Republic), with an area of about 96,000 square miles, and East Germany (German Democratic Republic), with an area of about 41,600 square miles. Bonn is the capital of West Germany, and Berlin-Pankow the capital of East Germany. Berlin, the largest city in Germany, is divided into a western sector and an eastern sector which are administered respectively by West Germany and East Germany.

Government.—*West Germany:* The German Federal Republic is a democratic and social federal state. It is divided into 11 Länder (states), one of which is the western sector of Berlin. The Basic Law, or constitution, applies to all Länder and decrees that the general rule of international law form part of the federal law. The constitutions of the Länder are required to conform to the principles of a republican, democratic, and social state based on the rule of law. Federal law supersedes Land law.

The organs of the Federal Republic are the

Federal Diet, which is elected by popular vote; the Federal Council, which consists of members of the governments of the Lander; and the Federal Assembly, which is composed of the members of the Federal Diet and an equal number of representatives of the Lander. The Federal President is elected by the Federal Assembly. The Federal Chancellor is elected by the Federal Diet on the proposal of the Federal President, and the Federal Ministers are appointed and dismissed by the Federal President upon the proposal of the Federal Chancellor.

Federal laws are passed by the Federal Diet and are submitted to the Federal Council, which has a limited veto. Judicial authority is exercised by the courts.

East Germany: The German Democratic Republic is divided into 14 Bezirke (districts). The principal officials of the government are the President of the German Democratic Republic and the Ministers, the Secretaries of State, and the Chairmen of Commissions that constitute the cabinet. The real governing power is vested in the Politburo of the Socialist Unity Party.

POPULATION.—The estimated population of West Germany (excluding the western sector of Berlin) was 53,050,000 in 1959. East Germany (including the eastern sector of Berlin) had an estimated population of 17,285,000 in 1959. In 1959, Berlin had an estimated population of 3,288,600, of whom 2,208,000 were in the western sector and 1,080,000 were in the eastern sector. Saarland, which became a part of Germany on 1 January 1957, had an estimated population of 1,040,000 in 1959.

PORTS.—The principal German ports in the area covered by this volume are Flensburg, Kiel, Travemunde, and Lubeck in West Germany; and Wismar, Warnemunde, Rostock, and Stralsund in East Germany.

INDUSTRY AND PRODUCTS.—Germany is predominantly industrial and has important

natural resources. Coal, lignite, iron ore, and potash are the principal minerals mined. Copper, zinc, and lead ores are also found, and in East Germany uranium mines are worked. Germany is the principal oil-producing country in Western Europe.

A variety of commodities are manufactured or processed. The steel and iron, electrical, and chemical industries are of primary importance. Textiles, cement, glass, porcelain, and earthenware are produced.

A large part of the area of Germany is agriculturally productive. The chief crops are wheat, rye, barley, oats, potatoes, and sugar beets. In some parts of the country the principal agricultural occupations are livestock-raising and dairying. Wine is produced in West Germany. Forestry is an industry of great importance.

Deep-sea and coastal fishery is carried on by fishing craft operating from North Sea and Baltic Sea ports.

COMMUNICATIONS.—All modern communication facilities are available. A network of canals connecting many of the rivers and lakes provides inland water transportation throughout much of Germany and into adjoining countries. The Nord-Ostsee Kanal, which connects the Baltic Sea with the North Sea, can be used by large seagoing vessels. There is international communication by cable, radio, telephone, and air.

HOLIDAYS.—The general holidays in Germany are New Year's Day, Good Friday, Easter Monday, May 1 (Labor Day), Ascension Day, Whitmonday, June 17, Prayer Day, Christmas Day, and December 26 (Second Christmas Day).

STANDARD TIME.—The standard time is that of the meridian of 15° E., or 1 hour fast of Greenwich mean time.

CURRENCY, WEIGHTS, AND MEASURES.—The monetary unit of West Germany is the deutschemark (West).

The monetary unit of East Germany is the deutschemmark (East). The value of this unit as established by the government of East Germany in 1953 has not been recognized by the International Monetary Fund.

The metric system of weights and measures is in effect.

DERATTING

1-7 Deratting can be carried out and Deratting Certificates and Deratting Exemption Certificates can be issued at the Danish ports of Aabenraa, Nakskov, Odense and Vejle. For additional Danish ports providing this service see H.O. 41.

Deratting can be carried out and Deratting Certificates and Deratting Exemption Certificates can be issued at the German ports of Flensburg, Holtenau, Kiel, Lubeck, Rostock and Wismar. Deratting cannot be carried out but Deratting Exemption Certificates can be issued at Stralsund.

DRYDOCKS AND MARINE RAILWAYS

1-8 DENMARK.—There are drydocks and marine railways at Nakskov, Nyborg, and Svenborg. Marine railways are also located at Ærøskøbing, Assens, Bandholm, Bogense, Egersund, Faaborg, Fredericia, Kalundborg, Korsør, Marstal, Middelfart, Odense, Rudkøbing, Sønderborg, and Stege. There is a drydock at Kolding.

GERMANY.—There are drydocks and marine railways at Kieler Hafen, Lubeck, Wismar, and Rostock. There are also drydocks at Flensburg and marine railways at Heiligenhafen, Travemünde, and Stralsund.

FISHERIES

1-9 Herring, cod, flounder, and eels are the most important catches in the waters of the area covered by this volume. Drift nets, dredge nets, dragnets, seines, fixed nets, weirs, and lines are used. Vessels engaged in fishing comprise motor craft, sailing craft, auxiliaries, and pulling boats.

Fishing is carried on throughout the year in Store Bælt and Lille Bælt. The spring season usually commences in the latter part of March and ends in June; the autumn season begins toward the end of September. In the western part of the Baltic Sea, especially in the vicinity of Flensburg Fjord, Schleimünde, Eckernförder Bucht, Kieler Förde, and Hohwacht Bucht and in the waters around Fehmarn, there is extensive herring fishing from May to November. Dredge net fishing is carried on in Lubecker Bucht from the beginning of December to the middle of April.

A DRIFT NET consists of a chain of nets joined together to form a row, sometimes as much as 1 mile in length, with one end secured to a fishing vessel. The other end is allowed to drift with the wind and current. Floats consisting of wooden blocks, cork buoys, small barrels, leather bladders, or other floating objects support the nets, the upper edges of which are usually from 10 to 16 feet below the surface of the water but in some areas may be on or just below the surface. The nets are usually laid out in the afternoon and taken in the following morning.

TRAWLING is carried on mainly in the wider and deeper parts of the fairways. Some trawlers work in pairs, the vessels of a pair dragging a trawl between them.

WEIRS are usually situated within about 350 feet of the shore but in some places they extend into depths of over 10 feet. FIXED NETS are laid between poles or spars and differ from weirs in that they may extend far from the coast and may lie in depths up to 30 feet.

MARKING OF FISHING GEAR.—Drift nets are marked by day with a black barrel or buoy, or with a buoy which may have a triangular flag. By night they are marked by a white light.

In Danish waters, fixed nets are marked at the outer ends by day with two square flags, one of a dark color and the other of a light color, and at night with a violet light.

In German waters, seines, trawls, and lines are marked by day at the ends lying in the western semicircle of the compass by two triangular flags displayed one over the other. The ends lying in the eastern semicircle of the compass are marked by single rectangular flags. Between its extremities the gear is marked by single triangular flags. Nets are marked by red flags and lines by black flags.

Lights and signals of fishing vessels.—Both Danish and German fishing vessels carry the signals and lights prescribed in the International Regulations for Preventing Collisions at Sea.

Danish trawlers working in pairs, in addition to carrying the prescribed signals and lights, may use searchlights to warn approaching vessels that might attempt to pass between them or to foul their fishing gear. The light beams are crossed in front of or between the trawlers to indicate they are connected.

Caution.—Because vessels and tows will be held responsible for any damage caused by them to fishing gear not laid out in the usual fairways, they are advised, except in an emergency, to avoid fouling such fishing gear.

BUOYAGE

UNIFORM SYSTEM OF MARITIME BUOYAGE

GENERAL

1-10 The International Uniform Systems of Buoyage as agreed at the International Conference at London in 1936 are described below and are presented graphically in plates I through IV at the back of the book.

There are two uniform systems, the "Lateral" system and the "Cardinal" system. The lateral or side marking system is generally used for well-defined channels. The cardinal or directional system is generally used to indicate dangers where the coast is flanked by numerous islands, rocks, and shoals, as well as to indicate

dangers in the open sea. In the latter system the bearing (true) of the mark from the danger is indicated to the nearest cardinal point.

One or both systems may be used in the same country, according to preference or local requirements, on condition that the limits of their respective use are clearly indicated in nautical documents and, if necessary, by means of appropriate marks. Where both systems are used simultaneously the transition from one system to the other is indicated by the buoys shown in plate IV. In case where there is no doubt as to what system is being used, the transition buoys may carry topmarks.

LATERAL SYSTEM OF MARKING FAIRWAYS AND CHANNELS

1-11 **Position of marks.**—In principle, the position of marks in the lateral system is determined by the general direction taken by the mariner when approaching a harbor, river, estuary, or other waterway from seaward, and may also be determined with reference to the main stream of the floodtide. The application of the principle shall be defined, as required, by nautical documents.

The term "starboard hand" denotes that side which will be on the right side of the mariner when approaching from seaward and the term "port hand" denotes the left side of the mariner.

Sides of channels.—*Starboard hand marks* are conical or spar buoys. Conical buoys are black, or, for purposes of differentiation, black and white checkered. Spar buoys are black, or, for purposes of differentiation or visibility, black with the upper part white. The topmark, if any, on a conical buoy is a black cone, point up, or, for purposes of differentiation but not at a channel entrance, a diamond. A spar buoy may carry a downturned broom as a topmark.

Light buoys show 1 or 3 white flashes or occultations; green lights of a character not allocated to the marking of wrecks; or both white

lights and green lights with the above characteristics.

Port hand marks are can or spar buoys. Can buoys are red, or, for purposes of differentiation, red and white checkered. Spar buoys are red. The topmark, if any, on a can buoy is a red cylinder, or, for purposes of differentiation but not at a channel entrance, a red "T". A spar buoy may carry an upturned broom as a topmark.

Light buoys show red lights with any number of flashes or occultations up to four; white lights with 2 or 4 flashes or occultations; or both red lights and white lights with the above characteristics.

Note.—The use of yellow instead of white in the checkered buoys is permitted in secondary channels.

Numbering and lettering.—If buoys at the sides of a channel are numbered or lettered, the numbering or lettering shall begin from seaward, odd numbers on the starboard hand and even numbers on the port hand.

Midchannels.—Midchannel marks serve to indicate the deep-water channel or fairway. They may be passed on either side, but should preferably be left on the port hand.

These marks should, as far as practicable, be distinctive and different from the principal characteristic shapes (conical, can, and spherical). The buoys are black and white, or red and white, vertically striped. The topmark, if any, should be of a distinctive shape other than cone, point up; cylinder; or sphere. Lights, if any, are to be of a character different from the neighboring lights on the buoys at the sides of the channel.

Middle grounds.—Middle grounds are marked on each end by spherical or spar buoys. Bifurcational buoys are on the outer ends of the middle grounds and conjunctive buoys are on the inner ends of the middle grounds.

When *the main channel is to the right*, both bifurcational and conjunctive buoys are red

and white horizontally banded. The topmarks, if any, on the bifurcational buoys are a red cylinder on the spherical buoy and a red cylinder over a red sphere on the spar buoy. The topmarks, if any, on the conjunctive buoys are a red "T" on the spherical buoy and a red "T" over a red sphere on the spar buoy.

When *the main channel is to the left*, both bifurcational and conjunctive buoys are black and white horizontally banded. The topmarks, if any, on the bifurcational buoys are a black cone, point up on the spherical buoy and a black cone, point up, over a black sphere on the spar buoy. The topmarks, if any, on the conjunctive buoys are a black diamond on the spherical buoy and a black diamond over a black sphere on the spar buoy.

When *the channels are of equal importance*, both bifurcational and conjunctive buoys are red and white horizontally banded. The topmarks, if any, on the bifurcational buoys are a red sphere on the spherical buoy and two red spheres, vertically displayed, on the spar buoy. The topmarks, if any, on the conjunctive buoys are a red St. George's cross on the spherical buoy and a red St. George's cross over a red sphere on the spar buoy.

Light buoys marking middle grounds will, as far as possible, show lights that are distinctive, and neither color nor rhythm will be such as to lead to uncertainty as to the side on which the buoy should be passed.

CARDINAL SYSTEM OF MARKING DANGERS

1-12 Position of marks.—The marks are placed off the danger in one of the four quadrants, North, South, East, or West, relative to the position of the danger. The north quadrant is deemed to lie between the northwest and northeast; the south quadrant between the southeast and southwest; the east quadrant between the northeast and southeast; and the west quadrant between the southwest and northwest.

North quadrant.—The marker in this quadrant is a black conical or spar buoy with a wide white median band. The topmark, if any, is a black cone, point up. If lighted, it shows a white light with an odd number of flashes (preferably) or occultations.

South quadrant.—The marker in this quadrant is a red can or spar buoy with a wide white median band. The topmark, if any, is a red cone, point down. If lighted, it shows a red (preferably) or white light with an even number of flashes (preferably) or occultations.

East quadrant.—The marker in this quadrant is an ogival or spar buoy painted red above white. The topmark, if any, is two red cones, bases together. If lighted, it shows a red (preferably) or white light with an odd number of flashes (preferably) or occultations.

West quadrant.—The marker in this quadrant is a spindle or spar buoy painted black above white. The topmark, if any, is two black cones, points together. If lighted, it shows a white light with an odd number of flashes (preferably) or occultations.

Note.—If desired, the shapes of the markers may be limited to two, the conical shape being used in the northern and eastern quadrants and the cylindrical shape being used in the southern and western quadrants.

When spar buoys only are used, it may be advantageous in the northern and eastern quadrants to reverse the position of the darker colors. In this case, the spar in the northern quadrant would be white with a wide black median band and the spar in the eastern quadrant would be white above red.

MARKING OF WRECKS

1-13 Wrecks may be marked either in the lateral or cardinal system. Green is the predominant color of the markers and lights. Light vessels and buoys marking wrecks generally have painted on their sides in white the letter "W" and the word "Wreck" in the lan-

guage of the country under whose authority they lie.

Lateral system.—The lateral system is generally used for marking wrecks in the channels.

Markers to be left on the port hand are green can or spar buoys. The topmark, if any, is a green cylinder. If lighted, a group flashing (2) green light is shown.

Markers to be left on the starboard hand are green conical or spar buoys. The topmark, if any, is a green cone, point up. If lighted, a group flashing (3) green light is shown.

Note.—If the marker in the above two instances does not conform to the characteristic shape, the lower part of the marker shall be colored black or red, as the case may be, but the predominant color shall be green.

Markers that may be passed on either side are green spherical or spar buoys. The topmark, if any, is a green sphere. If lighted, a single occulting green light is shown.

Wreck-marking vessels that are to be left on the port hand have green hulls with the above-mentioned inscriptions on both sides. They will display a green cylinder above a green sphere in a position above the superstructure where they are distinctly visible. At night two green fixed lights are carried in lieu of the shapes. During periods of low visibility two strokes of a bell, if used, are rung at intervals of not more than 30 seconds.

Wreck-marking vessels that are to be left on the starboard hand have hulls and inscriptions similar to that described above, but display a green cone, point up, over two green spheres, all vertically shown. At night three green fixed lights are shown in lieu of the shapes. During periods of low visibility three strokes of a bell, if used, are rung at intervals of not more than 30 seconds.

Wreck-marking vessels that may be passed on either side have hulls and inscriptions similar to that described above, but display four green spheres, which are shown vertically in pairs.

At night four green fixed lights are shown in lieu of the shapes. During periods of low visibility four strokes of a bell, if used, are rung at intervals of not more than 30 seconds.

NOTE.—Vessels marking wrecks shall not carry the ordinary riding lights carried by a vessel at anchor.

Should the sound signals be given by means other than a bell, they shall be such as not to be mistaken for neighboring sound signals.

CARDINAL SYSTEM.—The cardinal system is generally used for marking wrecks outside the channels. Wreck marks are placed only in the eastern and western quadrants.

The markers in the eastern quadrant are green conical, ogival, or spar buoys that carry a topmark of two green cones, bases together. If lighted, the marker carries a green interrupted quick flashing light.

The markers in the western quadrant are green cylindrical, spindle, or spar buoys that carry a topmark of two green cones, points together. If lighted, the marker carries a green flashing light.

MISCELLANEOUS MARKERS

1-14 ISOLATED DANGERS.—Isolated dangers may be passed on either side. The markers are spherical or spar buoys painted in black and red horizontal bands and separated, if desirable, by a narrow white band. The topmark, if any, is a black sphere, or a red sphere, or a red and black sphere.

LANDFALLS.—Landfall marks serving to indicate the seaward approach to a harbor, river, or estuary are optional in shape and the topmark they carry, but they must not be misleading, having regard to the rules for channel marking. They are either black and white, or red and white, vertically striped. If lighted, they show a rhythmic light.

TRANSITION MARKS.—These marks indicate the change between the cardinal and lateral systems. The shapes and topmarks are optional, but they must not be misleading, having regard to the rules for channel marking. They are painted in red and white, or black and white, spiral bands.

QUARANTINE GROUNDS.—Quarantine ground markers have optional shapes but are yellow in color.

OUTFALLS AND SPOIL GROUNDS.—The shapes of these markers are optional, but the color is yellow above black. Lights are optional, but if carried, due regard should be paid to the character of other lighted marks in the vicinity.

MILITARY PRACTICE AREAS.—The limits of these areas are marked by buoys that have optional shapes. The markers are white with two blue stripes intersecting at right angles at the top of the mark, thus appearing as a cross when seen from above; in addition the lettering indicating in the national language a dangerous area (e.g., in English, "D.A.") appears on the marker.

DENMARK

GENERAL

1-15 Basic changes in buoyage in Danish and Swedish territorial waters became effective in 1965. These changes were made to bring the several marking systems of the northern countries into closer agreement and to reduce the contrast with the uniform buoyage system in use in most European countries. Differences remain between the Danish and Swedish systems. Swedish and Finnish buoyage systems now are generally in agreement.

In Danish waters the lateral system, where the starboard and port sides of a channel are distinguished, remains in effect. The starboard side of a channel is that side which is on the starboard side of an entering vessel. Figure 1 on page 13 indicates in which direction an entering ship proceeds in the channels; in the continuous channel it is generally the direction from the North Sea to the Baltic. Limfjord, Smaalands Channel, and the channel southward of Funen and Alsen Sundet are not buoyed as continuous channels but are considered basins which may be entered from either side.

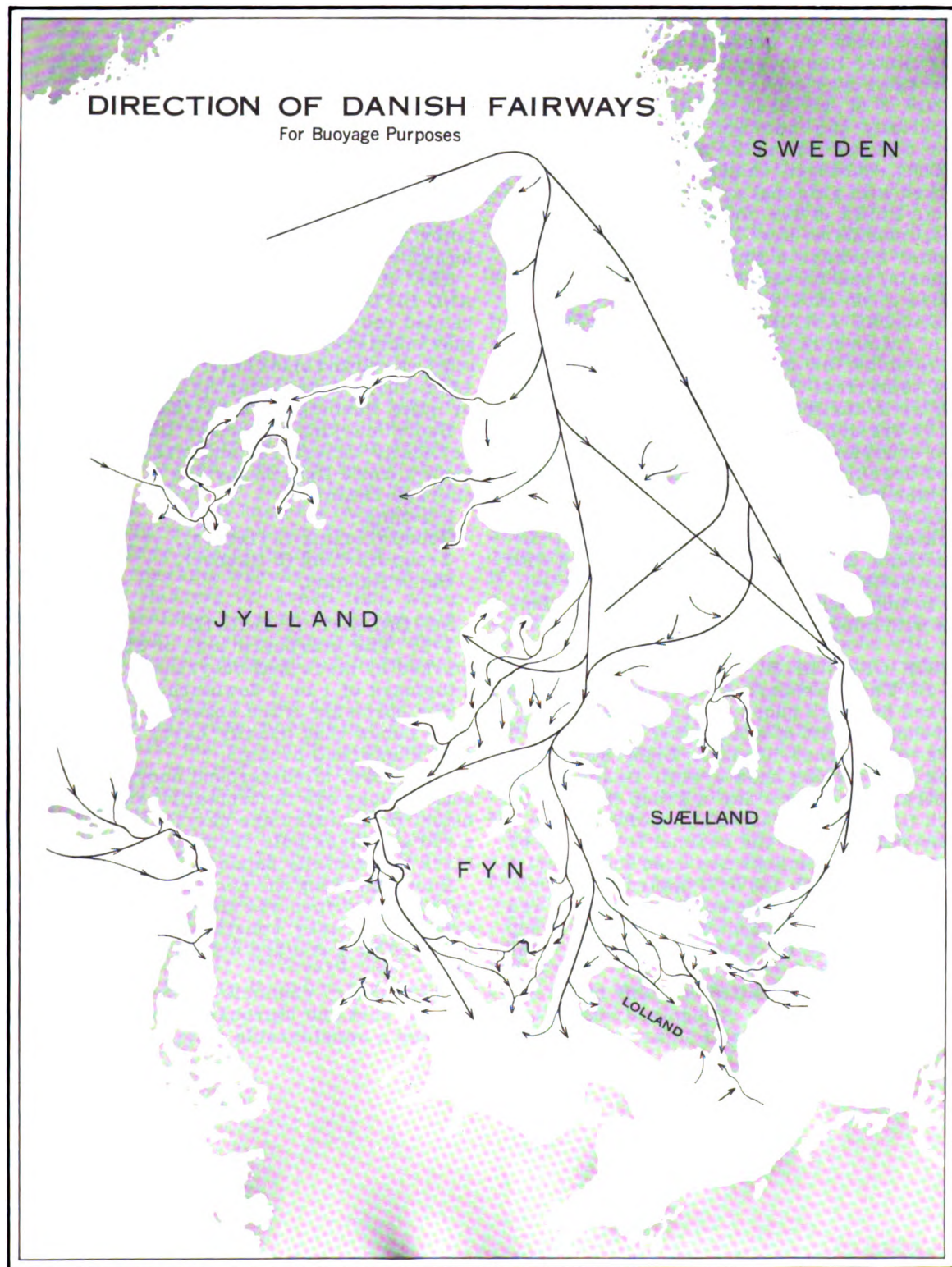


Figure 1

While the channels as a rule, are buoyed on both sides, the swept channels, which are recommended or prescribed, usually have their center line marked, although marking of their sides may occur.

Plate V at the back of the book presents graphically the buoyage system which became effective in Danish waters in 1965.

NOTE.—Dredged channels are sometimes marked with aids that are moored outside the actual limits of the channel. Where this occurs, mariners are advised to give these channel markers a good berth. Outside such channels, beacons and daymarks are erected ashore or on shoals.

BEACONS AND DAYMARKS are constructed of framework or solid structures of either steel, stone, or wood. They may or may not have topmarks. They are erected ashore as well as in shallow waters. Beacons and daymarks are colored for the purpose of making them conspicuous against the background; the color does not indicate the side of the channel in which they are used.

RADAR REFLECTORS.—Various buoys, marking channels, approaches, shoals, obstructions, and wrecks may be equipped with radar reflectors.

It is important not to confuse radar reflectors with buoyage topmarks.

MAIN CHANNELS

1-16 The starboard side of the channel is marked by black buoys. If topmarks are carried they consist of a black pole with 1, 2, or 3 black downturned brooms. Light buoys are black in color and show a white flashing light on straight reaches and a group flashing or quick flashing light at turning points.

The port side of the channel is marked by red buoys. If topmarks are used they consist of a red pole with 1, 2 or 3 upturned brooms. Light buoys are red in color and show a red flashing light on straight reaches and a group flashing or quick flashing red light at turning points.

Reflectors are installed on many buoys and spars, so they may be recognized with a flood light. Reflecting material shines white, red, or green and means:

White: Starboard side of channel or center line of route.

Red: Port side of channel.

White - Red: Approach, middleground or channel bifurcation.

Green: Wreck, in rare cases a drain pipe or dumping ground.

Green-White: Green-Red: Firing area, aid to be kept to starboard, respectively, to port of entering ships.

The number of reflecting rings of the same color means, as a rule, the number of topmarks carried by the aid.

SEA BUOYS, MIDDLE GROUND BUOYS, AND BIFURCATION BUOYS are horizontally banded red and black. If topmarks are carried they consist of a red and black pole surmounted by a red and black horizontally banded ball. Light buoys show group flashing white or red, or quick flashing white or red.

Buoys marking the center line of routes are vertically striped red and black. Light buoys show a white light of any one of the following characteristics:

Flashing.

Group flashing (2 flashes).

Group flashing (3 flashes).

Quick flashing.

SECONDARY CHANNELS

1-17 The starboard side of the channel is marked by black spar buoys that usually carry a topmark of 1 or 2 downturned brooms.

The port side of the channel marked by red spar buoys that usually carry a topmark of 1 or 2 upturned brooms.

Sea buoys, middleground buoys, and bifurcation buoys are horizontally banded red and black. If topmarks are carried they consist of a red and black pole surmounted by a red and black horizontally banded ball.

Buoys marking the center line of routes are vertically striped red and black. If topmarks are carried they consist of a red pole surmounted by a red and black vertically striped ball.

In secondary channels where the sea buoys and the port and starboard hand buoys are to be seen a considerable distance, buoys simi-

lar to those used in main channels, but of smaller size, are used.

If a secondary channel is also available to deep-draft vessels, this will be indicated by using floating aids with short thick spars without topmarks. Black spars will be used on the starboard side of the channel and red spars on the port side of the channel.

BOAT CHANNELS AND NARROW ENTRANCES

1-18 Boat channels may be marked by unpainted spar buoys with topmarks or, in rare cases, on the starboard side by tree twigs.

MARKING OF WRECKS

1-19 Wrecks are marked by light buoys or spar buoys which are always placed in the northeast or southwest quadrants from the wreck, and between the wreck and the traffic routes. In open waters they are placed as nearly as possible northeastward or southwestward of the wreck. In narrow waters they are placed as nearly as possible on a line from the wreck at right angle to the channel, so that it may be necessary to place the marking on either side of the quadrant.

Light buoys marking wrecks are green and show a group flashing (2) green light when moored in a direction between north and east of the wreck and a flashing green light when moored in a direction between south and west of the wreck.

Spar buoys marking wrecks are green and carry 2 green flags when moored in a direction between north and east of the wreck and 1 green flag when moored in a direction between south and west of the wreck.

In Flensburger Forde the rule in force is that entering vessels keep wreck buoys with one flag or one flash to starboard and those with two flags or two flashes to port.

A wreck or obstruction which shows above water displays a quick flashing light. This light is white when the incoming vessel is to keep the wreck on her starboard hand and red when she is to keep it on her port hand.

MISCELLANEOUS MARKERS

1-20 Spoil grounds, and sewer outfalls, are marked by yellow conical buoys without topmarks.

Firing practice and closed areas are marked by horizontally banded yellow and black conical or spar buoys. If topmarks are carried they consist of yellow and black pole surmounted by a horizontally banded, yellow and black, ball.

Light buoys marking cable breaks are yellow and show a quick flashing green light.

Buoys used for surveying purposes are usually white and have a flag topmark.

Submarine cables are marked with buoys with topmarks consisting of a black pole with a white diamond between two red balls.

Submarine cables are also marked ashore by range beacons. These beacons usually consist of red and white banded posts with slatted topmarks. The front beacon is surmounted by a disk and the rear beacon is surmounted by a disk over a diamond. The disks are painted white and have red centers and the diamond is painted white and has a red border. The distribution of each color in the topmarks depends on the background of the beacons. If lights are shown, the front beacon shows a colored (red or green) light in the disk and a white light in the diamond. When the beacons are in range the white diamond will be visible between the disks by day, and 1 white light is seen between 2 colored lights at night.

High tension cables are marked by beacons that are somewhat different in structure but they are all painted white. If lights are shown, they consist of two lights of the same color and are displayed vertically.

White beacons with triangular topmarks are also in use. In certain main channels, beacons with trapeziform topmarks surmounted by 1 to 3 disks are employed.

SUNKEN SUBMARINES.—Danish submarines are equipped with telephone buoys that are released in the event a submarine is sunk. The buoy is furnished with a green

triangular flag and a signal lamp. A telephone, by means of which the submerged submarine may be contacted, is contained in this buoy; on the upper side of the buoy are inscribed instructions for using the buoy.

Vessels seeing such a buoy should lower a boat and communicate with the submariner by means of the telephone. Boats should not moor to this buoy as it is attached to the submarine by the telephone cable. In addition information regarding the sighting of such a buoy and its position should be sent to the Ministry of Marine, Copenhagen.

WINTER BUOYAGE

1-21 In general, buoyage during the winter remains unchanged. Where changes do occur they may be as follows:

1. Bell buoys are replaced by small buoys but with the same structure, color, and topmark.

2. Some buoys may be withdrawn.

3. During ice conditions, light buoys and whistle buoys may be replaced with spar buoys and conical buoys.

When ice conditions prevail the positions of the buoys are not to be relied on.

WEST GERMANY

GENERAL

1-22 West Germany and the Soviet Zone of occupation of Germany have adapted in principle the International Uniform Systems of Buoyage. The lateral and cardinal systems now in effect in German coastal waters are described herein and are shown graphically in plates VI through XI at the back of the book.

LATERAL SYSTEM OF MARKING FAIRWAYS

1-23 GENERAL.—The lateral system is used to mark the approach to, the entrance of, and the sides of a fairway or channel. It is also used to mark dangers lying within a channel. In

general, the starboard hand of a channel has black markers and the port hand has red markers. The starboard hand of a channel is deemed to be that side which is on the right side of the mariner when entering from seaward and the port hand is the left side of the mariner under the same circumstances.

If a channel connects two areas of open water which can be approached from either end, the starboard hand is that side which is on the right side of the mariner when coming from a westerly direction, namely, from south through west to north. Should a channel of this kind curve in such a manner that there is doubt as to which side is the starboard hand and which the port hand, then the northernmost entrance shall be deemed to be the principal one and the entire channel marked accordingly.

TYPES OF MARKERS.—Beacon buoys, conical buoys, can buoys, spherical buoys, pillar buoys, barrel buoys, and block buoys (drift blocks) are used as floating markers. Beacon buoys also include light buoys, bell buoys, and whistle buoys. Block buoys may replace any other buoy, but they will have a shape similar to that of the buoy they replace.

Beacons, dolphins (post groups), perches and poles are used as stationary markers and are erected on the shore or in shallow water.

Topmarks are used either singly or compositely. Higher topmarks, such as twigs, brooms, and straw bundles are used upon smaller markers.

Markers on the starboard hand of the channel are marked by letters and those on the port hand by numbers. The letters and numbers follow in sequence from seaward. In the case of long channels, "Z" is followed by "A" on the starboard hand and "99" is followed by "1" on the port hand. Intermediate markers on the starboard hand are marked by numbers after the letters of the preceding aid, such as "A1", "A2", "B1", and so on, and those on the port hand by small letters after the number of the (continued on page 17)

preceding aid, such as "1a", "2a", "1b", and so on.

To differentiate adjacent channels, the markers may have the initial letter of the channel name precede the regular letter or number of the aid, such as "H2" to mean "Hubertgat 2". If the marker designates a principal channel together with a secondary channel or the ends of a middle ground, then the name of the secondary channel or middle ground is shown on the aid in a position below the name and mark of the principal channel, such as "MOWENSTEERT".

Approach markers.—Beacon buoys mark the approach to or the entrance of a channel or fairway. The name of the channel is usually painted on the buoy.

Starboard hand marks are black beacon buoys with a topmark, if any, consisting of a black spindle. The buoys show an interrupted quick flashing white light (preferably) or flashing or occulting white light with 1 or 3 flashes or occultations.

Port hand marks are red beacon buoys with a topmark, if any, of two red cones, points together. The buoys show a quick flashing white light (preferably) or flashing or occulting white light with 2 or 4 flashes or occultations.

Midchannel marks are black and red vertically striped beacon buoys with a topmark, if any, consisting of a black double cross. The buoys show an occulting white light.

1-24 Fairway markers.—*Starboard hand marks* are black conical buoys or, in special positions, beacon buoys. The topmark, if any, is a black cone, point up, or a black diamond, or, at certain important places, a black spindle. Black beacons or dolphins, or unpainted poles with or without a topmark consisting of a downturned broom are also used. If lighted, the markers show a flashing or occulting white light with 1 or 3 flashes or occultations, or, at especially important places, an interrupted

quick flashing white light. A green fixed light is shown by markers on the edge of a channel or at a harbor entrance in the case that the lights are permanently established.

Port hand marks are red pillar buoys or, in special cases, red can buoys. The topmark, if any, is a red cylinder, or a red "T", or two red cones, points together. Red beacons or dolphins, both with staffs, or perches, or unpainted poles with upturned brooms are also used. If lighted, the marker shows a group flashing or group occulting white or red light with 2 or 4 flashes or occultations, or, at especially important places, a quick flashing light. A red fixed light is shown by markers on the edge of a channel or at a harbor entrance in the case that the lights are permanently established.

Midchannel marks are black and red vertically striped beacon buoys with a topmark, if any, of a black double cross. If lighted, the marker shows a flashing or occulting red light.

Middle ground markers.—Middle grounds are banks and larger shoals which divide a channel into two navigable arms that come together. The division and joining of the channel, regarded by an entering vessel, are marked by beacons and beacon buoys along the ends of the middle ground. The outer buoys are called bifurcational buoys and the inner buoys are called conjunctional buoys. These buoys indicate the positional relation of the main and secondary channels to the middle ground or whether both channels are of equal importance. **Lights** on middle ground markers are the same as those marking the sides of fairways except in cases where both arms are lighted; under these circumstances an occulting white light is shown.

When *the main channel is to the right*, the bifurcational and conjunctional markers are red with a black horizontal band. The topmark of the bifurcational marker is a red cylinder over a red sphere and on the conjunctional marker a red "T" over a red sphere.

When *the main channel is to the left*, the bifurcational and conjunctive markers are black with a red horizontal band. The topmark of the bifurcational marker is a black cone, point up, above a black sphere and on the conjunctive marker a black diamond over a black sphere.

When *the channels are of equal importance*, the bifurcational and conjunctive markers are black and red vertically striped buoys. The topmark of the bifurcational marker is two black and red vertically striped spheres and on the conjunctive marker a black upright cross over a black and red vertically striped sphere.

Branching channels.—Channels that branch off or join with the main channel in areas other than at middle grounds are marked at the entrances with beacons and beacon buoys. The lights are quick flashing or interrupted quick flashing where both arms are lighted; otherwise the rules for the lighting of the sides of fairways are in effect.

When *the branching channel is on the right side of the main channel*, the right side of the entrance of the branch channel has a black marker. The topmark, if any, is a black cone, point up. The left side of this entrance has a black marker with a red horizontal band. The topmark, if any, is a black cone, point up.

When *the branching channel is on the left side of the main channel*, the right side of the entrance of the branch channel has a red marker with a black horizontal band. The topmark, if any, is a red cylinder. The left side of this entrance has a red marker. The topmark, if any, is a red cylinder.

If *both channels are of equal importance*, the right side of the main channel and the left side of the branching channel, which is equal in importance to the main channel, has a black and red vertically striped marker. The topmark, if any, is a black and red vertically striped sphere.

Small reefs and shoals in the channel.—

Small reefs and shoals in the channel that can be passed on both sides are marked by beacons or beacon buoys, the upper parts of which are red and the bottom black. The topmark, if any, is a black sphere, and the light is red occulting.

CARDINAL SYSTEM OF MARKING NATURAL DANGERS

1-25 General.—The cardinal or directional system is used to mark natural dangers outside of the buoyed channels. The marks are placed on the danger itself or along its edge in one of the four quadrants, North, South, East, or West, relative to the position of the danger. The north quadrant lies between the northwest and northeast; the south quadrant lies between the southeast and southwest; the east quadrant lies between the northeast and southeast; and the west quadrant lies between the southwest and northwest.

Types of markers.—Beacons, beacon buoys, pillar buoys, and poles, all of which carry topmarks, are markers used to mark natural dangers.

The markers are inscribed with the names of the dangers, either in full or abbreviated, and with the letters "N", "S", "O", or "W", according to the direction in which they lie in relation to the danger.

The designation "South Buoy" in plate VIII means that the buoy is moored on the north side of the danger and must be left on the south side of a vessel that is passing by. The same application is to be made with the other named buoys in this figure.

North quadrant.—This marker is black with a white horizontal band and carries a topmark of two black cones, points up. If lighted, it shows a flashing or occulting white light with 1 or 3 flashes or occultations, or shows an interrupted quick flashing white light.

South quadrant.—This marker is red with a white horizontal band and carries a topmark of two red cones, points down. If lighted, it shows a flashing or occulting red light (in exceptional cases, a white light) with 2 or 4 flashes or occultations, or shows a quick flashing red light.

East quadrant.—This marker is red in its upper part and white on the bottom and carries a topmark of two red cones, bases together. If lighted, it shows a flashing or occulting red light (in exceptional cases, a white light) with 1 or 3 flashes or occultations, or shows an interrupted quick flashing red light.

West quadrant.—This marker is black in its upper part and white on the bottom and carries a topmark of two black cones, points together. If lighted, it shows a flashing or occulting white light with 2 or 4 flashes or occultations, or shows a quick flashing white light.

Detached danger marker.—This marker is placed upon the shoal. It is painted in red, white, and black horizontal bands and carries a topmark of a black sphere. If lighted, it shows a red (sometimes white) occulting light.

MARKING OF WRECKS

1-26 General.—Wrecks and other hindrances (other than shoals and reefs) to navigation are marked according to the lateral system when within the channel and according to the cardinal system when outside the channel. The markers used are light vessels, light buoys, buoys, or marks upon the wreck itself.

The light vessels are painted in green in the upper part and carry the word "Wrack" in large white letters on both sides of the hull. Temporary light vessels may have only a large green sign with the word "Wrack" in white instead of the green painting. Green daymarks and green lights are shown from the superstructure. Anchor lights are not carried.

Light buoys and buoys are green and have the word "Wrack", or the letter "W", in white on their sides. Green topmarks are always carried. Lights, if shown, are green.

Lateral system.—*Wreck markers to be left on the starboard hand* are green conical or beacon buoys with a topmark consisting of a green cone, point up. If lighted, they show a group flashing (3) green light. The light vessel carries a daymark consisting of a green cone, point up, above two green spheres; at night, three fixed green lights are shown in lieu of the shapes. The fog signal, if any, is three strokes on a bell.

Wreck markers to be left on the port hand are green can, spar, or beacon buoys with a topmark consisting of a green cylinder. If lighted, they show a group flashing (2) green light. The light vessel carries a daymark consisting of a green cylinder over a green sphere; at night, two fixed green lights are shown in lieu of the shapes. The fog signal, if any, is two strokes on a bell.

Wrecks markers that are passable on both sides are green spherical or beacon buoys with a topmark consisting of a green sphere. If lighted, they show an occulting green light. The light vessel carries a daymark consisting of four green spheres that are shown vertically in pairs; at night, four green fixed lights are shown in lieu of the shapes. The fog signal, if any, is four strokes on a bell.

Cardinal system.—Green spar or beacon buoys with green topmarks are used in the four quadrants and on the wreck itself. They are arranged in the same form as that of the cardinal system of marking natural dangers (sec. 1-25). Lights are shown only on the east and west quadrant markers and on the wreck itself. The east quadrant marker shows an interrupted quick flashing green light; the west quadrant shows a quick flashing green light; and the mark on the wreck itself shows a green fixed light.

MISCELLANEOUS MARKERS

1-27 Submarine cables and pipelines are marked with a black spherical buoy with the word "Kabel" or the letter "K" in white. The landing places are marked by a beacon consisting of a white panel with a black inverted anchor, the whole surrounded by a red border and crossed with a red diagonal stripe. When a directional range is used, the front beacon is similar to that used at a landing place but surmounted by a red triangle, point up. The rear beacon is a red triangle, point down.

Quarantine anchorages, are marked by a yellow buoy. The topmark, if any, is a yellow flag.

Spoil grounds are marked by buoys with the upper part yellow and the lower part black. The topmark, if any, is a black flag.

Explosive anchorage areas are marked by a yellow buoy with the letter "P" in black.

Prohibited areas are marked by a white buoy with a blue cross. The word "Sperrgebiet" or "Sperr-G" in black is painted on the side.

ROADSTEAD LIMITS.—A red buoy with or without a red cylindrical topmark is moored on the left side of the adjacent channel. A black buoy with or without a black conical topmark, point up, is moored on the right side of the adjacent channel.

Fishing areas are marked with a blue buoy with or without a yellow fish topmark. Sometimes a spar buoy is used.

Measured distances are marked by black and white horizontally banded buoys with topmarks consisting of one or more black slanting crosses.

Mooring buoys are painted in red and white alternate quarters.

Compass adjustment buoys are painted in black and white alternate quarters.

Racing grounds are marked by red and white horizontally banded buoys with a white flag topmark.

Ferry landings are marked by a rectangular marker, red above white diagonally.

WINTER SEA MARKS

1-28 Beacon buoys (also light and sound buoys) that mark channels can be replaced by smaller winter sea marks. These replacements have the form used in the lateral system or they may be spar buoys with the same color, inscription, and topmark of the beacon buoys.

EAST GERMANY**GENERAL**

1-29 East Germany and West Germany have adapted in principle the International Uniform System of Buoyage. See section 1-10 through 1-14 and sections 1-22 through 1-28.

1-30 This section has been deleted.

1-31 This section has been deleted.

1-32 This section has been deleted.

SIGNALS**DENMARK**

1-33 **STORM SIGNALS.**—Denmark's Radio transmits daily weather reports and storm

warnings for Denmark, Southern Baltic, Kattegat, Skagerrak, the North Sea, Faeroerne and the waters around Faeroerne.

The coastal stations, Blaavand, Roenne, and Skagen transmit storm warnings in Danish and English. The coastal stations Skagen, Lyngby and Blaavand transmit daily weather forecasts in English.

DREDGE SIGNALS.—Dredges in Danish waters engaged in carrying out underwater operations shall carry, in addition to the signals required by the, "International Rules of the Road," the following signals:

On the side on which the dredge is to be passed—
By day.—A black diamond.

By night.—Two green lights displayed vertically.

On the side on which the dredge is NOT to be passed.

By day.—A black ball.

By night.—Two red lights displayed vertically.

The signal for passing or the signal **FORBIDDING** passing may be carried on both sides of the dredge if required by circumstances.

During periods of poor visibility—

In addition to the signal for a vessel at anchor required by the, "International Rules of the Road", the dredge shall sound the following signals on the bell.

A series of single strokes on the bell indicates that vessels shall pass the dredge as they would a red channel buoy: incoming vessels pass the dredge on their port side; vessels proceeding seaward pass the dredge on their starboard side.

A series of double strokes on the bell indicates that vessels shall pass the dredge as they would a black channel buoy: incoming vessels shall pass the dredge on their starboard side; vessels proceeding seaward shall pass the dredge on their port side.

Dredges should be passed with caution and at speeds consistent with safety.

SUBMARINE SIGNALS.—Vessels conveying Danish submarines during practice will display the International Code flag signal "NE2". This signal is a warning to vessels that submarines are in the vicinity. Vessels observing it should give a conveying vessel a good berth and keep a good lookout for submarines, whose presence may only be indicated by their periscopes above water. They should also navigate with care as submarines rising are not always in a condition to maneuver immediately, or to show the proper signals for a vessel not under control.

See section 1-36 for sunken submarines.

PILOTAGE SIGNALS.—See section 1-37.

MINESWEEPING SIGNALS.—Danish naval vessels engaged in minesweeping, towing sweeping gear, or ships on trial runs for the purpose of making safety arrangements against magnetic mines will show the following signals:

1. When engaged in minesweeping—

By day.—A black ball at the foremast head and a similar ball at the yardarm on the side or sides on which the sweeping gear is towed.

At night.—Green lights displayed in a manner similar to the black balls.

2. When minesweeping gear is being towed but not being used for sweeping—

By day.—The International Code flag signal "KJ1", shown at the foremast head.

At night.—The lights prescribed by the Regulations for Preventing Collisions at Sea for a vessel towing.

Minesweeping gear towed by vessels in (1) and (2) will show a clear light at night.

3. Vessels on trial runs for the purpose of making safety arrangements against magnetic mines will show the International Code flag "2nd Substitute".

Vessels engaged in minesweeping are not to be approached within a distance of about 1/4 mile, and ships are not to cross their courses within a distance of about 1/2 mile. Under no circumstances is a vessel to pass through a formation of minesweepers, or between the minesweeper and the buoy vessel following it. Vessels engaged in towing minesweeping gear or in making trials in connection with safety arrangements against magnetic mines are not to be approached within a distance of 50 yards.

FIRING PRACTICE.—When firing from a fort or a battery ashore takes place, the following signals are generally shown from that particular fort or battery:

By day.—The International Code flag "B".

At night.—A red light.

Naval vessels conducting target practice with shell fire, torpedo firing, or dropping of depth charges display the same signals.

Patrol vessels operating in prohibited areas display by day 3 red balls, shown vertically, and at night 3 red lights similarly arranged.

INTERNATIONAL ICEBREAKER SIGNALS.—The signals listed in Table 1 are special icebreaker support single-letter signals established by international agreement for communication between icebreaker and assisted vessels. Additional signals are found in H.O. Pub. 102. The signals are only to be

made by sound, visual or radiotelephony means and have only the meaning given in the table. They do not relieve any vessel from complying with the International Regulations for Preventing Collisions at Sea.

Icebreaker assistance, with the subsequent use of icebreaker support signals is introduced and concluded by the following two-letter signals:

WM Icebreaker support is now commencing. Use special icebreaker support signals and keep continuous watch for sound, visual or radiotelephony signals.

WO Icebreaker support is finished. Proceed to your destination.

In addition to the signals in Table 1, the following supplementary signals may be used:

The signal K (— . —) by sound or light may be used by an icebreaker to remind ships of their obligation to listen continuously on their radio.

The signal .. — .. by sound and/or light may be used by an icebreaker only to stop the headway of a ship in an ice channel ahead of and approaching, or going away from the icebreaker. When used by the vessel in addressing the icebreaker, the signal means "I am stopping headway".

Table 1

SPECIAL INTERNATIONAL ICEBREAKER SIGNALS

BY ICEBREAKER

BY ASSISTED VESSEL

A . —	Go ahead (proceed along the ice channel)	I am going ahead (I am proceeding along the ice channel).
G — — .	I am going ahead; follow me.	I am going ahead; I am following you
J . — — —	Do not follow me (proceed along the ice channel).	I will not follow you (I will proceed the ice channel).
P . — — .	Slow down.	I am slowing down.
N — .	Stop your engines.	I am stopping my engines.
H	Reverse your engines.	Reverse your engines.
L . — . .	You should stop your vessel instantly.	I am stopping my vessel.
4 —	Stop. I am ice-bound.	Stop. I am ice-bound.
Q — — . —	Shorten the distance between vessels.	I am shortening the distance.
B — . . .	Increase the distance between vessels.	I am increasing the distance.
5	Attention.	Attention.
Y — . — —	Be ready to take (or cast off) the tow line.	I am ready to take (or cast off) the tow line.

The below listed single letter signals, with the exception of M, may, when made by sound, be used only in compliance with the International Regulations for Preventing Collisions at sea.

Single-letter signals which may be used during icebreaking operations:

- | | | |
|---|-----|---|
| E | . | I am altering my course to starboard. |
| I | .. | I am altering my course to port. |
| S | ... | My engines are going astern. |
| M | — — | My vessel is stopped and making no way through the water. |

If more than one vessel is assisted, the distances between vessels should be as constant as possible; watch speed of your own vessel and that of the vessel ahead. Should speed of your own vessel go down, give "Attention" signal to the vessel following.

SCANDANAVIAN ICEBREAKER SIGNALS.—Icebreakers of Denmark, Finland, Norway and Sweden, when in communication with vessels requiring assistance, use the signals WM, WO, A, P, N, H, (. . — . .), Y, 5 and K drawn from the special international icebreaker support signals (see above). These signals, made by sound and visual means only,

have the same intent as the international signals, with the exception of the signal H which is used by assisted vessels only to repeat a signal made by an icebreaker.

German Icebreaker Signals.—West German icebreaker signals conform to the special international icebreaker signals.

GERMANY

1-34 Storm signals.—Storm warnings are broadcast by radio from Norddeich and Kiel. Information concerning these broadcasts is given in H. O. Pub. No. 118A (Radio Weather Aids).

Visual storm signals are displayed at various places on the German coasts of the Baltic Sea. The locations of the storm signal stations are given with the related features described in chapters 4, 5, and 6 of this volume. The signals for expected winds of force 8 or over according to the Beaufort scale are made with black cones by day and with white and red lights at night. These signals are as follows:

Two cones, points up, or a red light over a white light indicate that a northeasterly storm is expected.

Two cones, points down, or a white light over a red light indicate that a southeasterly storm is expected.

One cone, point down, or two white lights indicate that a southwesterly storm is expected.

One cone, point up, or two red lights indicate that a northwesterly storm is expected.

In conjunction with the day signals, a red flag displayed with any one of them indicates that the wind is expected to veer, or shift in a clockwise direction, and two red flags similarly displayed indicate that the wind is expected to back, or shift in a counterclockwise direction.

The lights, the cones indicating northeasterly and southeasterly storms, and the flags of the two-flag signal are disposed vertically.

In addition to the storm signals a black ball by day and a red light at night (a white light over a green light in the waters of West Germany) are used to indicate that the wind is expected to increase in strength to a force of from 6 to 7 according to the Beaufort scale.

Dredge signals.—A dredge at work in German waters displays a red ball by day and a red light over a white light at night on the side on which vessels can best pass. A red light is shown at night on the side which is less suited for the passing of vessels.

If a red ball is displayed by day and a red light over a white light are shown at night on both sides of the dredge, vessels must keep the dredge to port when passing.

Two black cones, points together, by day and a red light over a green light by night indicate that passing is prohibited on the side of the dredge on which such signal is shown.

A ball over two cones, points together, by day and three vertically disposed lights, the upper of which is red, the middle green, and the lower white, by night indicate that the channel is blocked.

During thick weather and with passage available on only one side of the dredge, a rapid ringing of the dredge's bell followed by a series of single strokes indicates that an incom-

ing vessel should keep the dredge to starboard when passing and an outgoing vessel should keep the dredge to port. A series of double strokes following the rapid ringing of the bell indicates that an incoming vessel should keep the dredge to port when passing and an outgoing vessel should keep the dredge to starboard.

The signals described above also apply to salvage vessels, diving craft, and other floating maintenance, salvage, and construction equipment that must be passed with special care and at reduced speed.

Pilotage signals.—See section 1-38.

Minesweeping signals.—The following signals are displayed by German vessels when engaged in minesweeping:

By day.—A black ball at the foremast head or only masthead, and at the yardarm on the side or sides on which the danger exists another such ball or balls.

At night.—Green lights shown in the same positions as the black balls.

In addition, on the approach of another vessel, these vessels display the International Code flags "PB" to warn other vessels against approaching too closely.

German minesweepers engaged in sweeping operate in groups of three or more vessels connected by wire hawsers. While sweeping, the maneuverability of the vessels is greatly reduced. Vessels in the vicinity of working minesweepers must not cross their course within $\frac{1}{2}$ mile astern of the last group. Under no circumstances should vessels attempt to pass between minesweepers or between groups.

Firing practice.—Artillery firing practice may take place by day or at night in certain areas off the German coast. The signal stations controlling these areas should be watched closely, and vessels in the vicinity should act in accordance with the signals displayed. Patrol vessels may be stationed offshore to warn approaching vessels.

West Germany: The location and limits of firing areas adjacent to the Baltic coast of

West Germany and the signals and regulations that apply to navigation in these areas are given with the descriptions of the related portions of the coast.

East Germany: Firing practice may be carried on along the East German coast in areas in which shipping is prohibited, or is subject to special regulations or instructions. When firing in progress, lightships, signal stations, and patrol craft in the vicinity display the following signals:

By day.—The International Code flags "BB".

At night.—A red light above two white lights, disposed vertically.

Upon sighting either of these signals, a vessel in the restricted area should proceed according to instructions previously announced or published, or as directed by patrol boats.

The end of the firing practice is indicated by the day signals being lowered or the lights being extinguished.

When the firing is suspended for a short period during daytime, the International Code "1st repeater" is displayed in addition to the day signal indicating that firing is in progress.

1-35 Signals for target-towing vessels and targets.—In German waters a vessel towing a target or targets for firing practice will display by day two black cones, points down, disposed vertically, and at night, in addition to the lights prescribed by the International Regulations for Preventing Collisions at Sea,

two red lights above a white light. If a vessel approaches the tow too closely a flare will be displayed on the towing vessel.

Targets which are being towed at night when firing is not in progress display two white lights, one forward and the other aft, at the same elevation. When firing is in progress targets do not display any lights. As targets may be towed as much as a mile astern of the towing vessel, a wide berth should be given to the tow.

ICE-REPORTING SERVICE.—Reports concerning ice conditions in the water adjacent to the coasts of Germany are transmitted daily in German and English and in code (see H.O. Pub. 117A) from the Kiel radio station. Ice reports are also transmitted daily in German and English from the Norddeich radio station and in code from the radio station of Rugen. The Elbe-Weser radio station transmits ice information upon request.

Printed ice reports are issued daily, with the exception of Sundays and holidays, during the ice season. They contain not only the ice conditions in German waters, but also those in the waters of other northern European countries. These reports are distributed to harbor offices, pilot stations, and other maritime facilities at the various German ports.

ICEBREAKER SIGNALS.—See section 1-33.

Customs signals.—The following signals are made by German customs vessels to other vessels to indicate that the vessel signaled to is to stop and take aboard customs officials:

West Germany—By day: A white pennant with the inscription "ZOLL" over a green rectangular flag; at night: the multiple blinking of four green lights arranged in a vertical line.

East Germany—By day: a green rectangular flag; at night: three green lights arranged in a vertical line.

A sound signal consisting of a long blast followed by a short blast, sounded either by day or at night, may be substituted for the above signals.

Traffic signals.—The following signals indicate entrance and departure restrictions at German ports and approaches:

A cone, point up, under a ball and over a cone, point down, by day and a white light under a red light and over a green light at night indicate entry is prohibited (East German exception: a cone, point down, with a ball above and a ball below by day and a white light with a red light above and a red light below at night).

A cone, point up, between two cones, points down, or a white light between two green lights indicates that departure is prohibited.

A cone, point up, under a cone, point down, and over a ball by day and a white light under a green light and over a red light at night indicate entry and departure are prohibited.

The shapes and lights used in making the signals described above are disposed vertically.

If it becomes necessary to prohibit entry into a port or river mouth because of a serious emergency, three balls by day or three red lights at night, disposed vertically, will be displayed in a prominent place. Vessels sighting these signals must proceed strictly in accordance with instructions,

failing the receipt of which they must await the arrival of an escort vessel displaying the same signals.

Obstruction warning signals.—At certain places on the German coast the following signals are shown to indicate that an obstruction or obstructions which interfere with navigation are located in the vicinity:

By day.—Two balls over a cone, point down, disposed vertically.

At night.—Two red lights over a green light, disposed vertically.

Information concerning the obstructions can be obtained from pilot stations and harbor offices.

GENERAL

1-36 Vessels inconvenienced by searchlights.—If the navigation of a vessel is being inconvenienced by the glare from searchlights near a port, the vessel should make the International Code signal "PG 2". This signal should only be made when real urgency necessitates it. Unless the vessel is actually in the searchlight beam, it may be difficult for the operators to know which light is concerned.

This signal is designed to assist mariners; no liability whatever will be admitted.

Supplementary United States distress signals.—While United States Government vessels and aircraft in distress may exhibit the recognized international distress signals set forth in the International Regulations for Preventing Collisions at Sea, they are also equipped with an additional distress signalling device intended to supplement the regular distress signals. This apparatus emits an orange smoke by day and red flames at night.

British submarines and accompanying vessels.—British vessels accompanying submarines, which may be submerged, fly the International Code signal "NE 2" to indicate that submarines are in the area. Other vessels should navigate with caution and give a wide berth to any such vessel. If it is necessary to approach the vessel accompanying the submarine, vessels should proceed at slow speed until warning of the danger area is indicated by flags, semaphore, or other signal, and a good lookout must be kept for submarines, the presence of which may be indicated only by their periscopes.

A submarine submerged at too great a depth to show its periscope may indicate her position by releasing a smoke candle, which gives off a considerable amount of smoke on reaching the surface. The submarine may also indicate her position by red and white or red and yellow floats that are towed on the surface close astern.

It must not be inferred that submarines exercise only when accompanied by escorting vessels. Under certain circumstances warnings may be broadcast that submarines will exercise or are exercising in specified areas.

A sunken submarine which is unable to surface will try to indicate her position by the following methods:

(1) Release a spherical indicator buoy which has a flag pole to which a red flag is attached. The buoy may be yellow or painted in red and yellow checkers for the after and forward parts, respectively, of the submarine. Each buoy is marked with the name of the submarine and with instructions for the finder to notify naval, customs, or police authorities. Caution should be exercised that no attempt be made to secure the buoys as such an attempt might break the wire connecting the buoy with the submarine.

(2) Fire yellow or white smoke candles at regular intervals on the approach of a surface vessel. The smoke candles float on the surface and generate smoke for 2 or 3 minutes.

(3) Pump out fuel or lubricating oil.

United States distress and emergency signals and other local and foreign information on dangers.—The United States distress and emergency signals and other local and foreign information on dangers that are found in Notice to Mariners No. 1, which is published in January of each year, are hereby omitted from this volume.

The United States distress and emergency signals include minesweeping, signals between aircraft and surface craft, merchant vessel procedures for assisting aircraft that must ditch, caution regarding submarine operations, submarine emergency identification signals, and naval vessels navigational light waivers, and distinctive lights authorized for submarines.

Other local and foreign information on dangers include mines and swept channels in foreign areas, dangerous areas due to mines on the West Coast of Africa, air cushion craft (hovercraft), lights and signals for flexible oil barges (dracones), and caution regarding approach of single vessels towards naval formation and convoys.

PILOTAGE

DENMARK

1-37 Under normal conditions, pilotage in Danish waters is compulsory only in certain waters and then for vessels of certain tonnage or draft. Details of compulsory pilotage are given with the description of the related places in the body of the text.

Pilot vessels engaged in pilot service carry by day at the foremast a white and red flag, the upper part of which is white, and at the stern the ensign. Lightships and other vessels having pilots available for service display the same flag. Small boats fix the same flag to a staff.

At night, pilot vessels display the lights prescribed by the International Regulations for Preventing Collisions at Sea.

Vessels requiring pilot service should employ the signals found in the International Code of Signals.

GERMANY

1-38 In the West German waters described in this publication pilotage is not compulsory except at the ports of Travemünde and Lübeck and in the Nord-Ostsee Kanal. Except for certain small vessels, pilotage is compulsory at all East German ports. Details of pilotage procedure at different ports is given with the descriptions of the ports and their approaches.

When engaged in pilotage service, pilot vessels in German waters carry by day the International Code flag "H", and at night they show the lights prescribed by the International Regulations for Preventing Collisions at Sea.

Vessels requiring pilot service should employ the signals found in the International Code of Signals.

REGULATIONS

DENMARK

1-39 When approaching Danish waters.—During maneuvers, exercises, or for other reasons, vessels may be (1) prohibited from entering or leaving certain Danish inner waters, or (2) subject to special regulations.

At such times a warning signal consisting of three red balls by day and three red lights at night will be displayed vertically from conspicuous positions. Similar signals will be shown by patrol boats (sec. 1-33). Under cer-

tain conditions these patrol boats may also carry the pilot flag (sec. 1-37).

Vessels desiring to enter or leave Danish waters and having observed the warning signal should (1) by day display the pilot flag and await the arrival of the patrol or pilot boat and (2) at night, anchor outside Danish territorial waters or remain in the harbor.

Incoming vessels will receive instructions for navigation from patrol or pilot boats. Outgoing vessels should obtain this information from the harbor authorities.

Navigation in Danish waters.—Vessels navigating in Danish waters are subject to the International Regulations for Preventing Collisions at Sea as well as the following exceptions and additions.

Dredge signals: See section 1-33.

Narrow channels: In channels so narrow that vessels cannot pass without danger, inbound vessels shall give way. When local conditions admit, contrary regulation can exist.

Vessels shall pass one another at as slow a speed as is consistent with local conditions.

An overtaking vessel shall pass on the port side of the overtaken vessel. When conditions admit, the overtaken vessel shall give way so that passage can be made without danger.

Regulations concerning the admittance of foreign naval vessels to Danish waters in time of peace.—The term "Danish waters," as it appears in these regulations, comprises "inside" and "outside" territorial waters.

Inside territorial waters include harbors, harbor entrances, roadsteads, bays, fjords, and those parts of Danish waters lying inside of and between Danish islands, islets, and reefs which are not always covered by the sea. Lille Bælt is regarded as inside territorial waters. In Store Bælt and The Sound, only Danish harbors, harbor entrances, roadsteads, bays, fjords, and such other areas as are specifically designated are considered as inside territorial waters. Limfjorden, Isefjord, the passage between Fyn and Langeland, Smaalands Farvandet and its approaches, the fairways south of Fyn, and certain other inside territorial waters are regarded as closed waters.

Foreign naval vessels and vessels which, although not flying a naval flag, are owned or used by a foreign state and are employed as training or pleasure craft are permitted to pass through or remain in Danish territorial waters with the following exceptions and restrictions.

Advance notice must be given through diplomatic channels at least 8 days prior to entry into Danish territorial waters if the passage through or stay in those waters is to exceed 48 hours.

Passage through inside territorial waters or stay therein is permitted only when advance notice is given through diplomatic channels. Permission to pass through or remain in those areas designated as closed waters will ordinarily be given only to vessels in distress.

Advance permission must be obtained through diplomatic channels to enter the ports of Frederikshavn and Helsingør and the roadstead and port of København. If entry into København Red is solely for the purpose of passing through Hollænderdyb and Drogden, advance notice through diplomatic channels of such entry and passage is sufficient.

The notice mentioned in the two paragraphs immediately above must be given at least 8 days prior to the desired passage or stay.

Vessels in distress are not required to give advance notice or obtain advance permission when entering, passing through, or remaining in Danish waters where such notice and permission are normally required.

If more than three foreign naval vessels of the same nationality intend to stay at the same time in Danish waters within one and the same naval command, or if the stay of foreign naval vessels in Danish waters, regardless of the number of ships, is intended to exceed 4 days, permission must be obtained in advance through diplomatic channels.

Foreign naval vessels in Danish waters are not permitted to do surveying or to hold military exercises such as gunnery, rocket, or torpedo practice; minelaying; minesweeping; laying of smoke screens; and landing of armed parties.

Foreign submarines in Danish waters must be surfaced at all times and must have the naval flag hoisted.

GERMANY

1-40 When approaching German waters.—

During maneuvers and exercises, or for other reasons, vessels may be prohibited from entering or leaving German harbors and river mouths, or their movements may be subject to special regulations. At such times, the signals described in sec. 1-35 are displayed.

Vessels desiring to enter or leave German territorial waters and having observed the warning signal should display the pilot flag and await the arrival of a patrol or pilot vessel. If the warning signal is made at night, it is advisable to anchor outside German territorial waters or remain in port.

Incoming vessels will receive instructions regarding special regulations and navigational procedure from the patrol or pilot vessel. Out-

going vessels should obtain this information from the harbor authorities.

If hailed by a patrol vessel, or if a gun is fired therefrom, all vessels in sight must immediately stop or heave to.

Vessels must submit to examination when required.

CAUTIONS

GENERAL

1-41 Submarine cables.—Submarine cables may be laid within the area covered by this volume. In view of the serious consequences resulting from damaged submarine cables, vessels should take special care to avoid anchoring or fishing in the cable areas.

Vessels fouling a submarine cable should attempt to clear without damaging the cable. Anchors or gear that cannot be cleared should be slipped and abandoned, and no attempt should be made to cut a submarine cable. Certain cables carry high voltages, and serious injury or loss of life may result from attempting to cut a submarine cable.

The owners of vessels who are able to prove that they have sacrificed an anchor, a net, or other fishing gear, in order not to damage a submarine cable, may be compensated by the owner of the cable.

In order to establish a right to such compensation it is necessary, if possible, immediately after the accident, to draw up a report confirming the loss, supported by the testimony of the men in charge of the equipment; and the master of the vessel, within 24 hours after his arrival at the first port of return, or of call, to make his report to competent authorities. They will notify the consular authorities of the country of the owner of the cable.

NEMEDRI (North European and Mediterranean Routing Instructions).—Certain areas within the scope of this volume are declared danger areas because of the presence of mines.

NEMEDRI contains information that outlines the limits of the danger areas, the channels through these areas, and other information necessary for safe navigation. Mariners are urgently advised to consult NEMEDRI before entering the subject waters.

Until further notice NEMEDRI supersedes any "Directions" or other routing instructions given in this volume.

The most recent information on the subject danger areas is broadcast by radio navigational warnings and is published in the Notice to Mariners.

NEMEDRI buoys marking channels through the danger areas are not, as a rule, mentioned in this volume.

Changes in the bottom.—Several instances have been reported of vessels grounding on fragments of rock which have apparently been detached and lifted from the bottom by the action of ice or currents. These dangers may rise several feet above the level of the bottom as shown by soundings. It is advisable that vessels, especially those of deep draft, should not be taken into depths that are only slightly in excess of the draft except in cases of urgent necessity.

These detached rocks have been encountered in Store Bælt, especially the southern part; Lille Bælt; The Sound; and off the Baltic coast of Schleswig-Holstein.

OCEANOGRAPHY

CURRENTS

1-42 Kattegat, The Sound, and the Belts.—The Kattegat together with The Sound and the Belts can be regarded as the connecting link between two hydrographically different sea regions, the Baltic Sea on the east with its continental influences and the North Sea and the Skagerrak on the west with their oceanic influences. The resultant movements of water in the area are influenced primarily by the

density difference between the Baltic and the North Seas. Relatively light, fresh surface water, originating from land drainage into the Baltic Sea, moves northward through the Belts, The Sound, and the Kattegat into the Skagerrak. In spite of temporary variations in the directions of surface currents brought about by other factors (namely winds), the northgoing current predominates on the average over long periods of time.

In contrast to the northgoing surface flow there is a southgoing subsurface flow of relatively heavy saline water from the North Sea and the Skagerrak into the Baltic Sea. This subsurface flow enters the Baltic Sea primarily through Store Bælt, being prevented from passing through The Sound because of a sill in the southern part where depths are less than 5 fathoms.

Observations in the Kattegat show that the horizontal boundary between northgoing and southgoing currents is generally found to coincide with the position of the 25‰ (parts per thousand) isohaline. This is not a constant depth but decreases from south to north. On an average it is at a depth of 13½ fathoms at Fehmarnbelt Lightship, 10½ fathoms at Halskov Rev, 7½ fathoms at Schultz's Grund, 6½ fathoms at Knobens, 1 fathom at Læsø Rende, and at the surface southward of Skagens Rev. As a result of this "wedging effect", speeds of the surface currents increase slightly from south to north. The opposing surface and subsurface flows in the Kattegat and the Belts cause local current rips and overfalls in which the current may run in a direction contrary to the prevailing circulation.

The northerly surface currents in the Kattegat, the Belts, and The Sound vary with the seasons and with varying wind conditions. They are strongest and most constant during the months of April and May when the Russian and German rivers break up and easterly winds prevail over the Baltic Sea (fig. 2).

The current sets northward through The Sound and upon entering the Kattegat divides into two branches, one of which follows the coast of Sweden northward and unites with the northgoing branch of the Jutland Current in the vicinity of Marstrand, and another which sets northwestward toward Anholt.

The major portion of the northerly current through Store Bælt continues through Samsø Bælt to the vicinity of Schultz's Grund where it spreads out and sends a branch on either side of the shoal. Northward of Schultz's Grund the currents continue in a northerly direction into the Kattegat. A part of the current from Store Bælt combines with that from The Sound and passes to the eastward of Anholt. The remaining portion turns toward the northwest and passes between Anholt and the Danish mainland.

The northerly current from Lille Bælt combines south of Samsø with a part of the current from Store Bælt and sets northeastward between Samsø and the mainland. It then turns northward along the coast of Denmark and sets into the Kattegat.

In the Kattegat northward of Anholt the currents from the Belts and The Sound set in a general northerly direction to pass on both sides of Læsø. The inability of Læsø Rende to accommodate the large volume of water approaching its southern entrance causes the currents to turn eastward at a position southward of Læsø and join the current from Store Bælt and The Sound which passes to the eastward of Læsø. Northward of Læsø the currents set northeastward toward Marstrand.

The southerly subsurface flow in the Kattegat originates eastward of Skagen where it appears first as a surface current branching off from the Jutland Current. The current turns in a southerly direction and sets toward Læsø, being confined mainly to the Danish coast by effects of the rotation of the earth. The extent to which this southerly current penetrates the

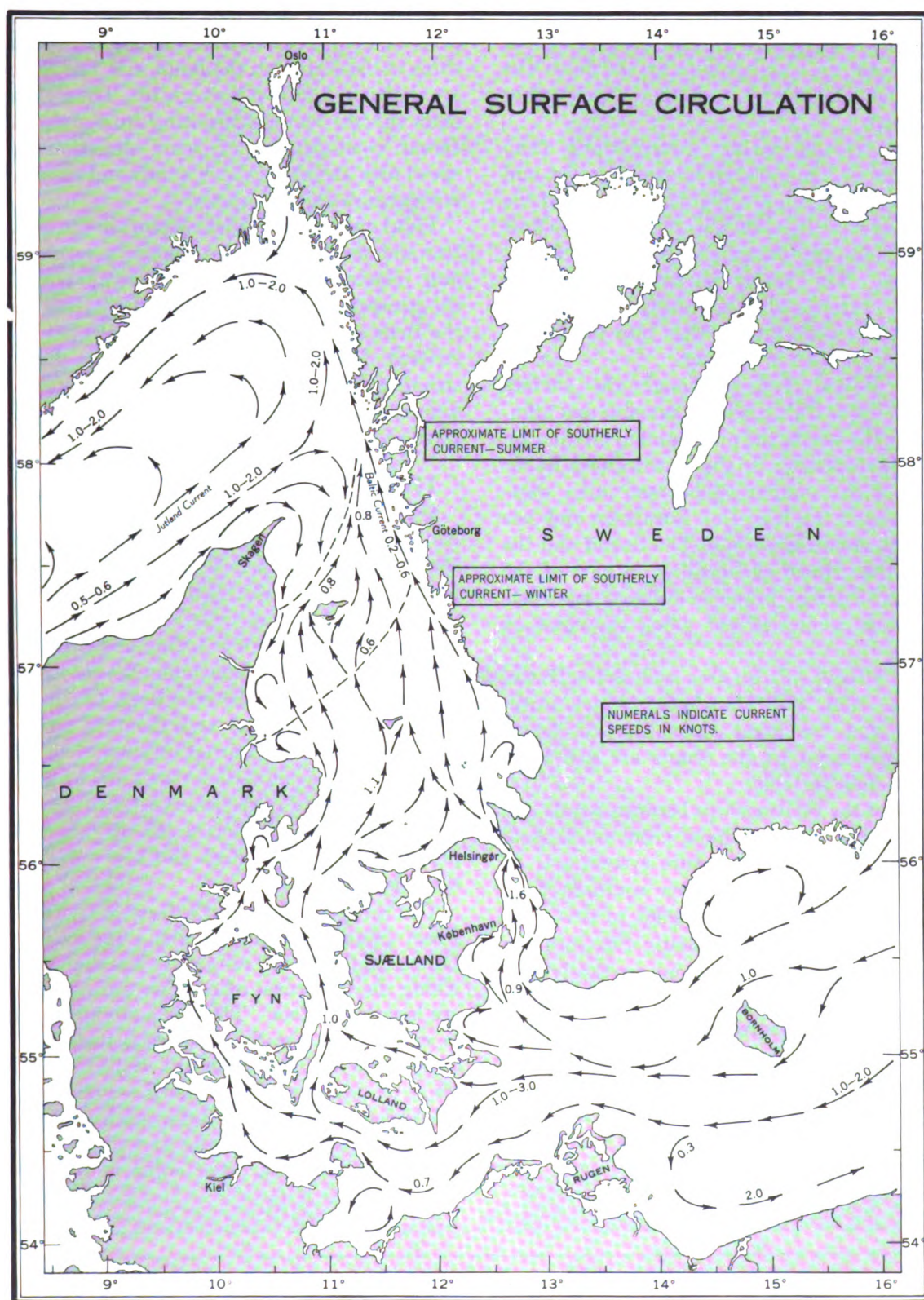


Figure 2

H. O. 141B

Kattegat before disappearing from the surface to become a subsurface current depends on the strength of the northgoing current from the Belts and The Sound and upon the weather conditions.

As mentioned earlier, observations from lightships in the entrance to the Kattegat and in Læsø Rende indicate that the position of the transition zone from surface to subsurface flow corresponds approximately with the 25 ‰ isohaline. The yearly variation of surface salinity indicates that southerly surface currents should penetrate farther into the Kattegat in winter than in summer.

1-43 Baltic Sea.—Although the surface currents in the Baltic Sea are variable and influenced by the winds, the predominant circulation is counterclockwise. In the southwestern Baltic a part of the southgoing current turns westward toward the island of Bornholm and sets in a westerly direction into The Sound and the Belts. Southward of Bornholm a part of the westgoing current branches off and sets eastward as a countercurrent along the coast of Poland.

Wind effects.—In an area such as the Kattegat, the Belts, and The Sound, which is restricted and has great variability of depth, currents induced by the winds are extremely complex and variable.

Some of the relationships between winds and the resulting currents have been established. For example: a high pressure system and its associated winds situated over southern Norway and Sweden generally tend to drive the surface waters from the Baltic Sea into the North Sea, thus inducing strong northerly currents in the Belts, The Sound, and the Kattegat. A low pressure system situated over southern Norway and Sweden has the reverse effect, i. e., it tends to drive the water from the North Sea into the Baltic Sea, thus inducing southerly currents in the Kattegat, the Belts, and The Sound.

Relationships between winds and surface currents derived from observations at 18 lightships in the Kattegat, the Belts, and The Sound are shown in figures 3 through 10. These charts show surface currents resulting from eight different combinations of wind direction and speed over the area. Both winds and resultant currents are daily averages.

Tidal currents.—Tidal currents in the Baltic Sea and the Kattegat are generally very weak and relatively unimportant in comparison to the general circulation and wind currents. In the Belts and The Sound, because of their constricted nature, tidal currents are slightly stronger than in other areas. The flood current sets southward and the ebb current sets northward at speeds ranging from 0.1 to 0.4 knot.

TIDES

1-44 General.—The tide advance in the Kattegat is a continuation of the tidal progression from the North Sea and Skagerrak. See figure 11. In the Kattegat the tide is always semidiurnal and has little diurnal inequality between the heights of morning and afternoon tides. As the progression enters the constricted regions of The Sound and the Belts, the diurnal component strengthens and the tide becomes mixed, with some diurnal inequality in the heights. In the southern portions of The Sound and the Belts and in the western Baltic, the tide acquires the diurnal character of the Baltic proper, with a single high and low water each tidal day.

The range of tide in the Kattegat is small. From Skagen southward along the coast of Denmark, the spring ranges are less than 2 feet. Along the west coast of Sweden, spring ranges are less than 1 foot. There is a slight increase in range from the Swedish coast toward The Sound and the Belts; in the Baltic Sea, the range of tide may be considered negligible.

Wind effects.—Storm tides, with which are associated a rise or lowering of water from the predicted tide level, often occur in this area.



Figure 3

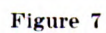




Figure 5

H. O. 141B





H. O. 141B

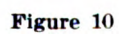


Figure 8



Figure 9

H. O. 141B



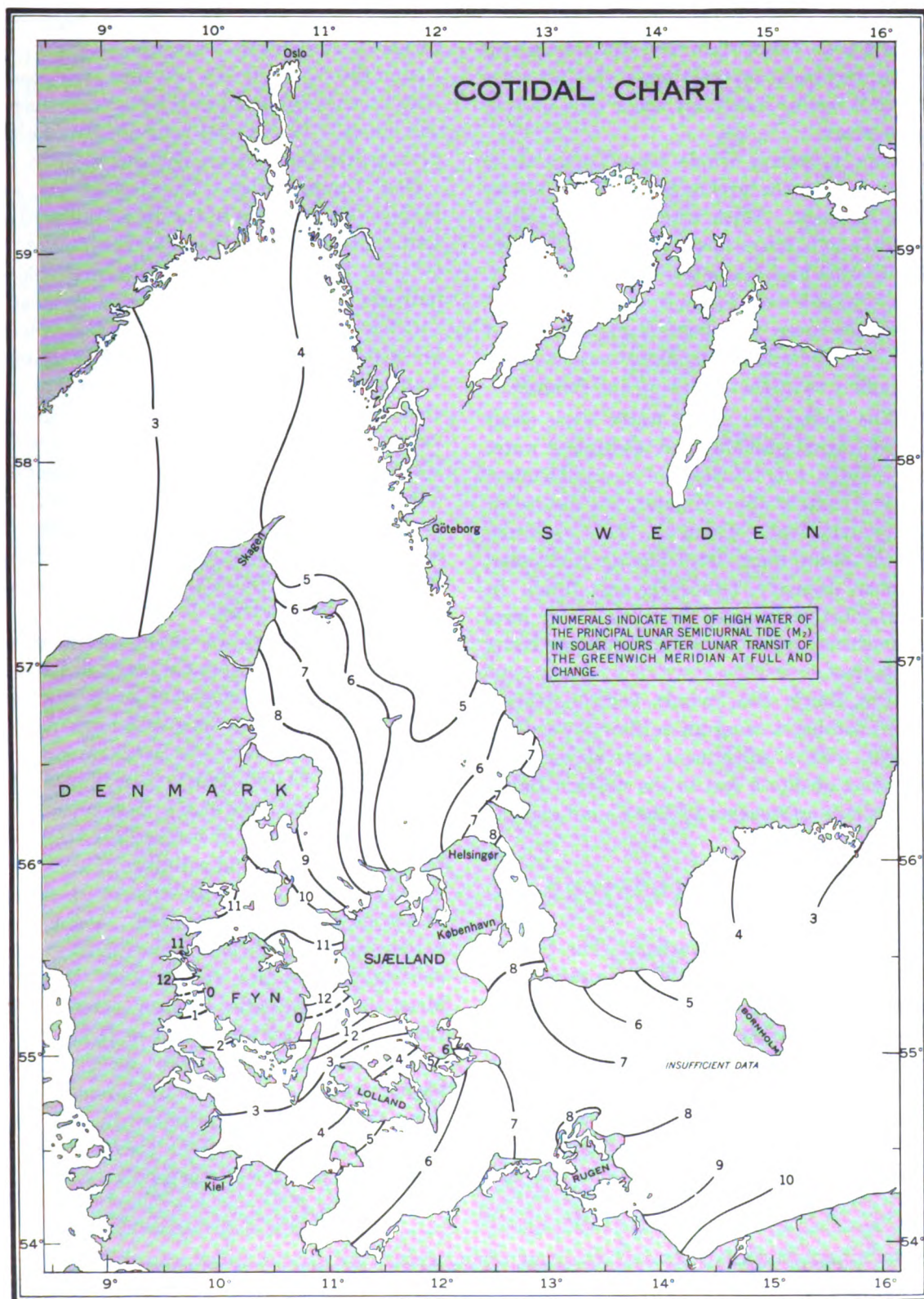


Figure 11

H. O. 141B

Variations from the predicted level are usually not more than 1 foot; however, differences of 2 or 3 feet may occur several times a year, whereas those of 5 feet or more may occur only once in several years.

Generally, strong winds from northeast to south will cause the level to fall along the shores of the Kattegat. With winds between southwest and north, water flowing from the Skagerrak will cause high water levels in the Kattegat. Storm tides are most likely to occur in autumn and winter since the average expectancy of winds of gale force during these seasons is approximately twice that of spring and summer.

In The Sound, the lowest water levels occur in March, April, and May and the highest water levels in July, August, September, and October. Mean low water is approximately $1\frac{1}{2}$ feet below mean water level. There is little variation from the mean water level during November, December, January, February, and June. In general, northwest gales raise the water level and southwest gales lower it, the range being 5 to $6\frac{1}{2}$ feet.

In the Baltic Sea, winds from northeast through southeast cause an outflow toward the Kattegat with a subsequent rise above mean water level of 3 to 5 feet in the western Baltic and southern approaches to The Sound and the Belts.

SEA SURFACE TEMPERATURE—SALINITY—DENSITY

1-45 General.—The Kattegat, The Sound, and to a lesser extent the Belts are regions of intensive mixing of two very different water types, i. e., relatively high saline water from the North Sea and brackish outflow from the Baltic Sea. As a result of precipitation and thawing, outflow from the Baltic Sea is greatest in summer and least in winter. Accordingly, at any location, salinities and densities are

higher in winter than in summer. Only slight surface temperature variations are found within the region at any one time; the greatest range occurs in spring as the result of thawing and runoff. The annual range of surface temperatures in these waters is about 30° F.

Sea Temperature.—Throughout the year, surface temperatures in the open waters of this area range from less than 34° F. to more than 62° F. Mean conditions, with probable departures from the mean indicated by shading for February, May, August, and November, are given in figures 12 and 13. For example: August temperatures in The Sound average about 61° F., and maximum and minimum values of about 67° F. and 55° F. may occur.

Greater seasonal variations in temperature occur near the shore and in the harbors. Any port may be icebound during some part of a severe winter, whereas in summer, temperatures frequently reach 75° F. or more, particularly along the German coast.

Salinity.—Figure 14 shows mean surface salinity in open water for February and August. Most pronounced changes occur in the Belts and The Sound where the greatest mixing takes place. Salinity over the area ranges from about 7.5 to 34.0‰ (parts per thousand) in winter and about 7.0 to 32.0‰ in summer.

Density.—Density of sea water is determined by its temperature and salinity. Thus, a wide density range exists in this area, corresponding to the large salinity variation. Mean winter values range west to east from 1.0270 to 1.0060 and summer values from 1.0230 to 1.0045. Mean surface densities in open water for February and August are shown in figure 15. In spring and early summer, the density of most harbor waters is appreciably lower than the mean values indicated in figure 15. Values as low as 1.0020 and 1.0030 are reported for København and the German ports.

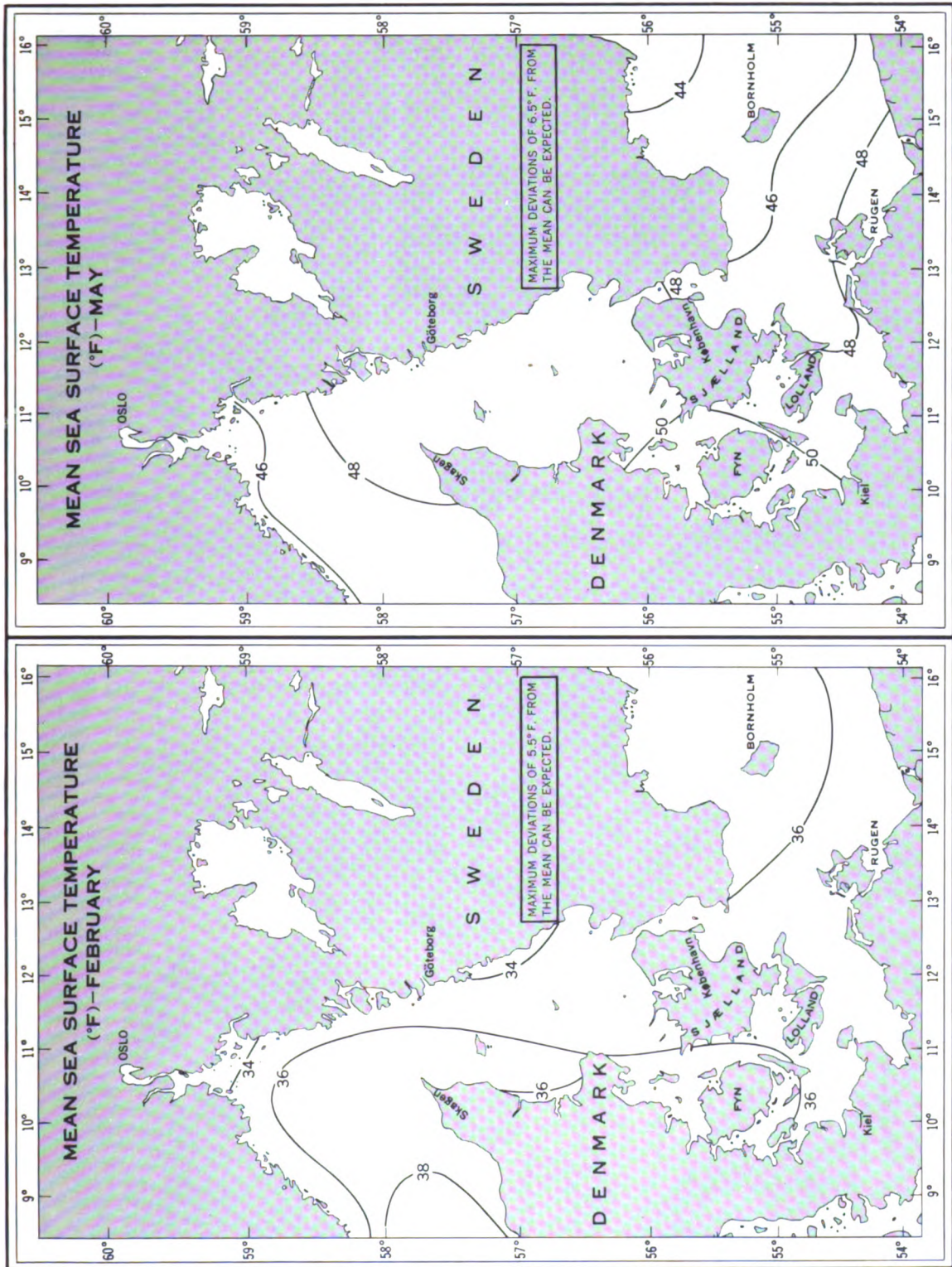


Figure 12

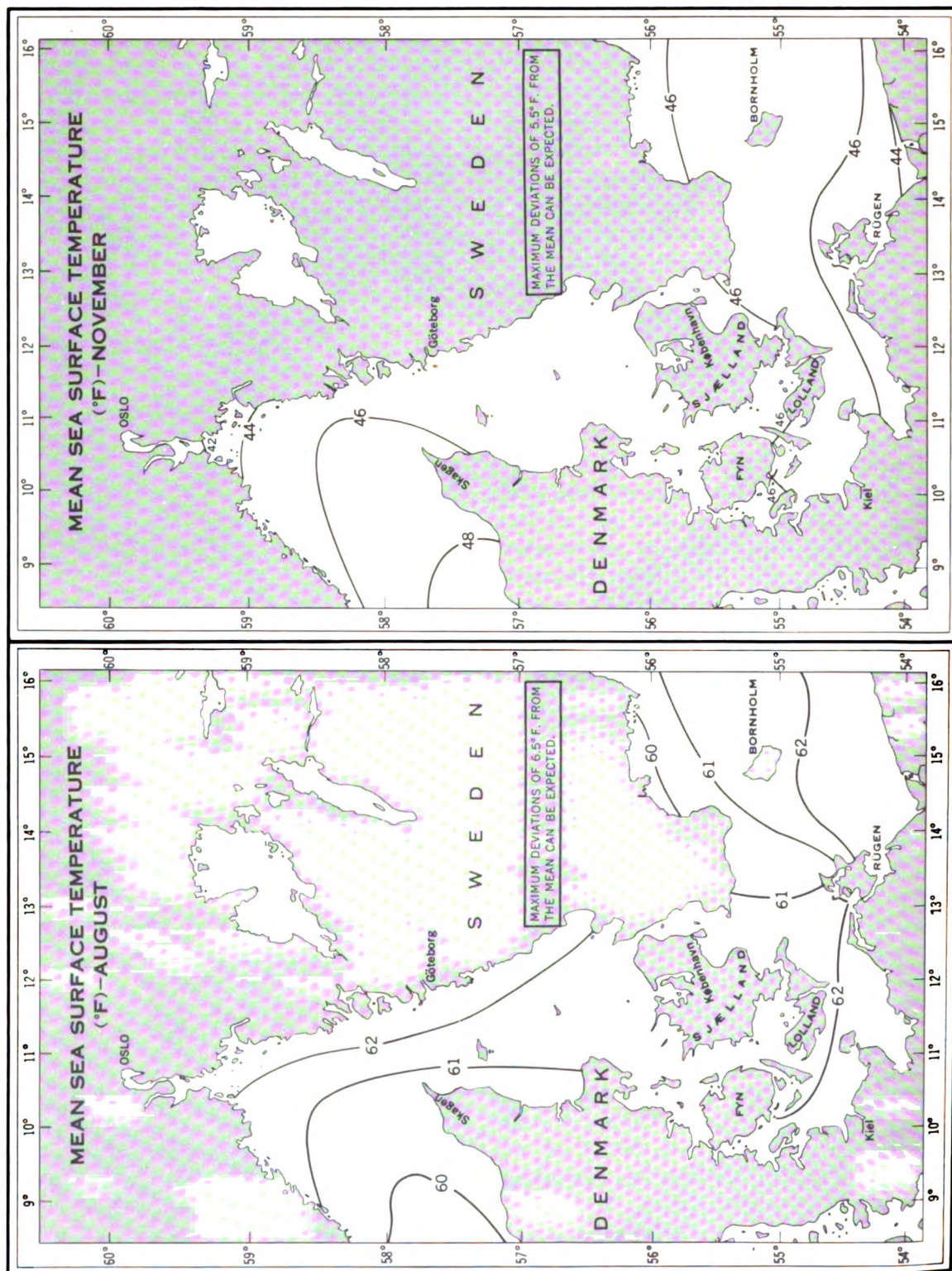


Figure 13

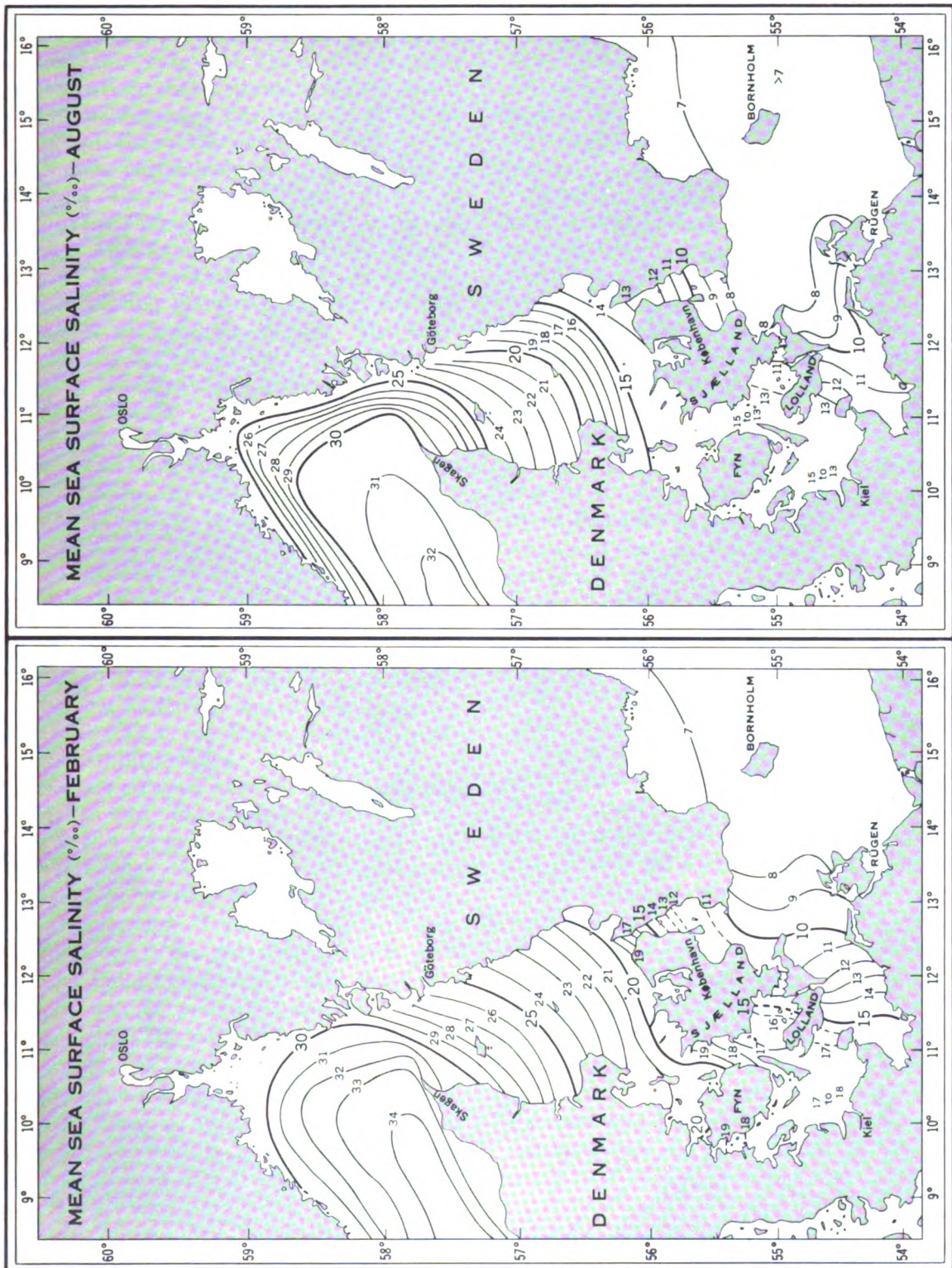


Figure 14

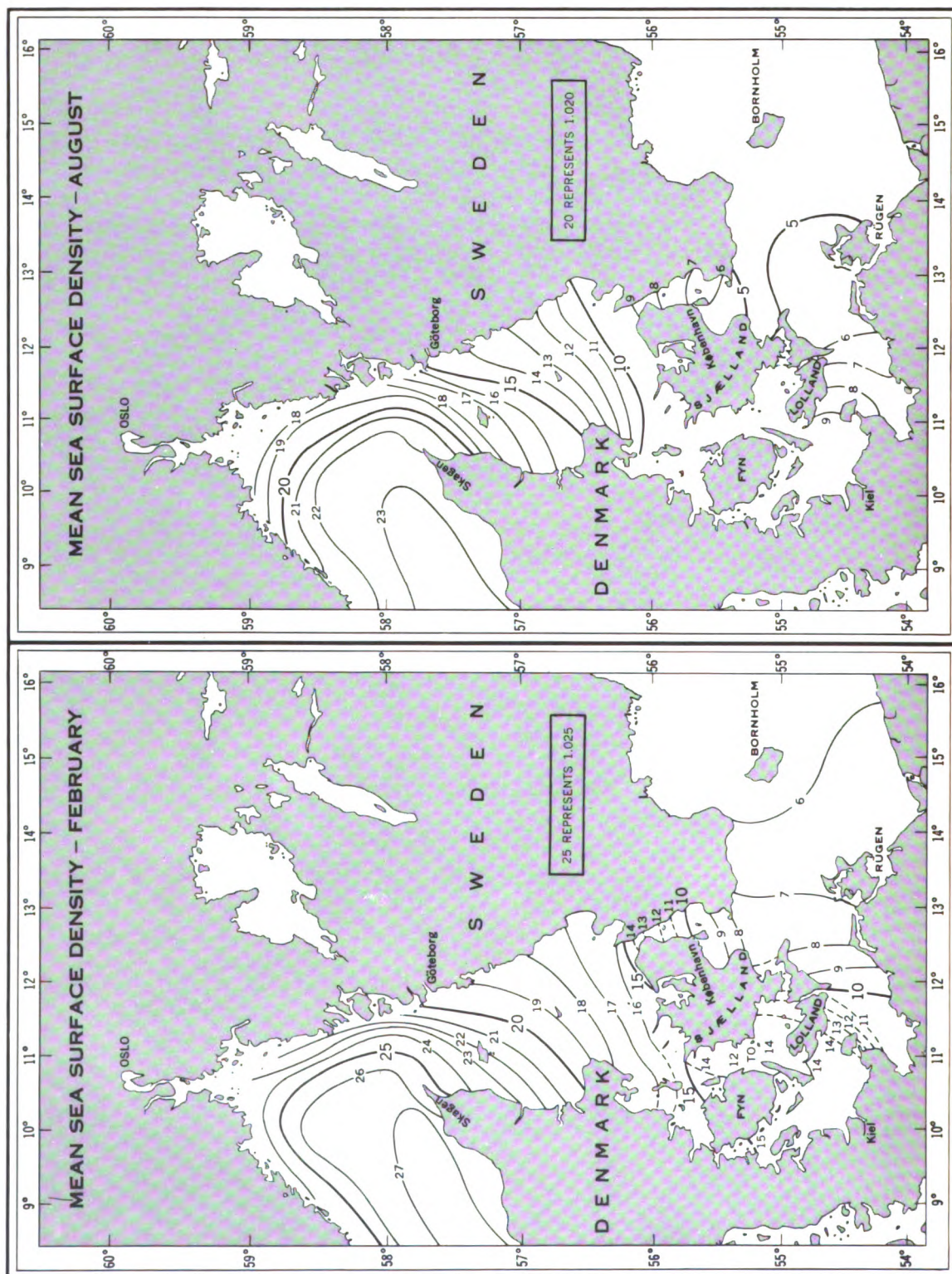


Figure 15

ICE

1-46 General.—The formation of ice in the Kattegat, the Belts, and The Sound does not follow a pattern that is normally characteristic of other ice regions. The reason for this irregularity is the variety of weather experienced in this area, particularly the changes of wind direction. There is, on the west, the warm maritime air that gives Denmark a temperate climate. And from the east, from northern Finland and Scandinavia, come the easterly winds that bring the severe cold weather that is inherent to formation of ice. The interchangeability of these climatological factors is such that the prediction of ice formation is extremely difficult.

The degree of development, the extent of coverage, and the duration of ice depends on the severity of the winter. During mild winters little or no ice may be formed except in the inner fjords and on the coastal shoals. During severe winters, which occur about once or twice every decade, navigation through some of the fairways and entering certain harbors may be entirely suspended. However, ice seldom forms in sufficient thickness to appreciably interfere with navigation for any length of time between the Kattegat and the Baltic Sea and in the harbors within this area.

It is a rare occasion when the entire Kattegat, the Belts, and The Sound are completely covered with ice to such a degree that navigation is hindered. As a rule the formation and growth of ice in these waters is more or less sporadic in nature. Sometimes the open waters are frozen before the coastal areas and in other instances the reverse may be the case. The Kattegat may be practically ice free whereas the Belts and The Sound may be frozen to a great extent, and vice versa.

There is no regularity in the appearance of ice. Sometimes ice appears in early December and disintegrates within 1 or 2 weeks. At other times the growth of ice continues so that by

January 1 there is sufficient coverage to cause difficulties in navigation. Then again there may be periods of mild weather at any time during the ice period—December through March—and at such times the ice may break up, weaken considerably by melting, or completely disappear.

In general, during severe winters ice appears in the fairways about the middle of January or later and lasts until the middle or end of March. Fast ice may appear sooner and remain later. However, a continuous period of ice lasting 2 or 3 months is rare.

Observations taken in the waters of the Kattegat, the Belts, and The Sound from the years 1920 to 1952 indicate that the earliest appearance of the first ice was November 9 and the latest appearance of the first ice was March 23; the average of all appearances of first ice came between December 22 and February 6. The earliest date of the disappearance of ice was December 14 and the latest date of disappearance of ice was April 21; the average of all disappearances came between February 21 and March 28.

In the western part of the Baltic Sea, ice appears to a greater or lesser degree practically every winter. During some winters when there is little frost the ice may be found only in the inner recesses of the coastal indentations and in the channels leading to some of the ports. During other winters fast ice forms along the shores and covers some of the bays, and drift ice is present in the open waters. During very severe winters the whole area may be completely covered with an ice that is thick enough to hinder navigation or close the area to shipping for weeks at a time.

In classifying the past 60 winters (1896 to 1956) according to ice frequencies, 2 percent of the winters can be classified as extremely severe, 8 percent very severe, 27 percent severe, 38 percent moderate, and 25 percent mild. The winters of 1953-54 through 1955-56 were considered

TABLE 4.—*Ice conditions in Store Bælt and Lille Bælt*
(Based on observations made in the winters 1906-7 to 1958-59)

Area of observation	Period of observation	Number of winters		Beginning of ice formations					End of ice formations					Number of days with ice			Shipping conditions during winters with ice					
		Observed	Ice free	Earliest	Early	Average	Late	Latest	Earliest	Early	Average	Late	Latest	Minimum	Average	Maximum	Minimum	Average	Maximum	Number of win- ters	Highest number of days	
STORE BÆLT																						
Sprogø, east channel	1906/7-1953/54	44	26	12/22/27	1/24	1/24	2/22/28	12/21/27	3/7	3/16	4/21/42	0	14	92	20	77	0	20	77	2	51	
Sprogø, west channel	1906/7-1953/54	45	31	12/26/27	1/27	1/27	2/13/29	1/6/28	2/28	3/16	4/21/42	0	12	87	0	75	0	24	75	3	56	
Nyborg Fjord	1906/7-1953/54	45	24	12/20/27	1/13	1/20	3/12/32	1/2/28	2/5	3/23	4/10/42	0	13	85	0	78	0	20	78	1	31	
Nyborg harbor	1906/7-1953/54	44	23	12/20/27	1/10	1/22	3/11/31	1/2/28	2/5	3/23	4/10/42	0	13	77	3	67	0	19	67	1	24	
Korsør, entrance	1935/36-1953/54	16	9	1/11/40	1/17	1/17	2/8/54	1/21/43	3/15	3/15	4/12/42	0	17	72	3	24	4	24	43	2	18	
Korsør harbor	1906/7-1953/54	45	27	12/20/27	1/14	1/17	3/11/31	1/19/28	2/15	3/8	4/11/42	0	12	70	0	53	7	56	49	6	68	
Omø, channel westward of	1906/7-1953/54	45	26	12/19/27	1/12	1/24	3/11/35	1/19/28	2/17	3/10	4/11/42	0	12	89	0	15	62	2	47	7	56	
Traneer Light, vicinity of	1932/33-1953/54	19	12	1/7/47	1/19	1/19	2/4/54	1/26/33	3/16	3/16	4/20/42	0	14	98	0	24	68	3	47	6	64	
Albuen, vicinity of	1906/7-1953/54	45	24	12/26/28	1/11	1/24	2/28/38	1/26/33	2/5	3/4	4/20/42	0	14	98	0	16	70	5	64	6	68	
Naksoy, approach	1906/7-1953/54	45	15	1/15/19	1/5	1/17	3/9/31	1/16/19	1/27	2/20	3/15	4/19/47	0	107	0	19	100	5	64	4	50	
Naksoy, inner fjord	1906/7-1953/54	43	4	1/15/19	1/23	1/23	3/11/32	1/23/33	2/4	2/24	3/15	4/8/42	0	33	112	0	19	100	5	64	4	50
Naksoy harbor	1906/7-1953/54	40	4	1/27/15	1/21	1/6	3/11/32	1/22/33	1/31	2/22	3/16	4/21/47	0	29	93	0	17	93	3	50	3	58
Keldsmø, vicinity of	1906/7-1953/54	45	31	1/9/47	1/27	1/27	2/12/30	1/26/33	3/14	3/14	4/22/42	0	12	93	0	24	77	0	24	77	4	58
LILLE BÆLT																						
Odense Fjord	1912/13-1953/54	39	3	11/17/19	1/6	1/6	2/13/28	12/24/33	2/13	2/26	4/10/42	0	35	107	0	85	0	26	85	3	33	
Bogense harbor	1906/7-1953/54	45	19	11/26/21	1/15	1/15	3/11/25	12/17/33	1/25	2/27	4/6/42	0	13	74	0	6	0	6	25	5	65	
Fredericia harbor	1906/7-1953/54	45	28	11/28/08	1/21	1/21	2/17/54	1/2/08	3/6	3/16	4/6/42	0	11	67	0	5	0	11	33	8	37	
Middelfart, vicinity of	1906/7-1953/54	44	32	12/23/27	1/28	1/28	3/4/09	1/8/20	3/12	3/12	3/27/42	0	8	51	0	10	0	10	30	6	60	
Kolding Fjord and harbor	1906/7-1953/54	44	32	12/13/19	1/23	1/23	3/4/09	1/8/20	2/16	3/7	4/8/42	0	39	104	0	19	0	19	90	6	60	
Aarsund	1906/7-1953/54	44	24	12/18/17	1/11	1/21	2/8/19	1/12/20	2/8	3/9	4/10/42	0	17	87	0	18	0	18	61	12	68	
Haderslev Fjord	1906/7-1953/54	43	4	1/8/21	1/15	1/15	3/12/25	12/24/33	2/11	3/5	4/10/42	0	11	73	0	27	0	27	106	12	68	
Assens, vicinity of	1906/7-1953/54	45	32	12/29/27	1/21	1/21	3/4/09	1/4/28	3/19	3/19	4/12/42	0	14	75	0	20	0	20	40	4	59	
Assens harbor	1906/7-1953/54	24	14	12/29/06	1/21	1/21	3/2/50	2/17/33	3/15	3/15	4/12/42	0	14	75	0	20	0	20	40	4	59	
Fyr Renden off Baaø	1937/38-1953/54	23	15	1/6/47	1/18	1/18	2/5/54	3/17/41	3/25	3/25	4/11/40	0	19	83	0	23	0	23	33	4	58	
Helene, vicinity of	1928/29-1953/54	23	19	1/6/47	1/21	1/21	2/13/54	1/27/33	3/25	3/25	4/11/40	0	19	83	0	23	0	23	33	4	58	
Ålbæk, vicinity of	1906/7-1953/54	44	19	11/11/08	1/25	1/25	2/9/31	1/4/08	3/12	3/12	4/14/40	0	15	86	0	13	0	13	53	8	71	
Skjoldnæs, vicinity of	1907/8-1953/54	43	28	12/19/27	1/21	1/21	2/9/31	1/7/28	3/20	3/20	4/14/40	0	15	86	0	13	0	13	53	8	71	
Skjoldnæs, Åls Sund	1906/7-1953/54	43	23	11/27/21	1/11	1/22	3/12/32	1/8/28	3/15	3/15	4/8/42	0	14	91	0	11	0	11	36	7	66	

TABLE 5.—Ice Conditions in the Fairways South of Fyn and in Smaaland's Farvandet
(Based on observations made in the winters 1908-7 to 1953-54)

Area of observation	Period of observation	Number of winters	Beginning of ice formations					End of ice formations					Number of days with ice			Shipping conditions during winters with ice							
			Earliest	Early	Average	Late	Latest	Earliest	Early	Average	Late	Latest	Minimum	Average	Maximum	Minimum	Average	Maximum	Highest number of days	Navigation hindered but not closed	Days when navigation hindered but not closed	Navigation hindered but not closed	Shipping conditions during winters with ice
SOUTH OF FYN																							
Dyreborg, vicinity of Faaborg Fjord Faaborg harbor Erskøbing harbor Marstal channel to Marstal harbor Rudkøbing channel to Rudkøbing harbor Svendborg Sund, western part Svendborg harbor Svendborg Sund, eastern part	1936/37-19/3/54	8	1/6/47	1/6	1/16	1/31	2/9/54	2/6/50	2/6	3/25	3/26	4/13/43	0	28	27	0	14	27	4	73			
	1906/7-19/3/54	15	12/22/27	1/6	1/20	1/31	3/11/32	1/4/04	2/8	3/9	3/26	4/10/43	0	22	20	0	19	20	4	73			
	1906/7-19/3/54	45	12/22/27	1/6	1/20	1/31	3/11/32	1/4/06	2/8	3/9	3/26	4/10/43	0	22	20	0	19	20	4	73			
	1906/7-19/3/54	45	12/14/33	1/5	1/19	1/27	3/12/32	12/16/33	1/26	3/2	3/22	4/10/47	0	25	104	0	14	49	5	73			
	1906/7-19/3/54	24	12/21/25	1/5	1/18	1/27	2/22/48	12/21/33	2/1	2/27	3/22	4/10/47	0	26	103	0	14	62	7	74			
	1906/7-19/3/54	45	11/28/15	12/31	1/18	1/27	2/22/48	12/16/20	2/3	2/28	3/23	4/10/43	0	28	104	0	17	57	8	74			
	1906/7-19/3/54	45	11/28/15	12/31	1/18	1/27	2/22/48	12/16/20	2/3	2/28	3/23	4/10/43	0	28	104	0	17	57	8	74			
	1906/7-19/3/54	45	12/2/25	12/29	1/13	1/31	3/12/32	12/23/15	2/1	2/25	3/17	4/7/43	0	21	90	0	17	73	5	74			
	1906/7-19/3/54	16	1/7/41	1/9	1/16	2/1	3/12/32	12/23/15	1/26	2/25	3/17	4/7/43	0	21	90	0	17	73	5	74			
	1933/36-19/3/54	16	1/7/41	1/9	1/16	2/1	3/12/32	12/23/15	1/26	2/25	3/17	4/7/43	0	21	90	0	17	73	5	74			
	1906/7-19/3/54	45	12/21/10	1/15	1/20	2/1	3/9/31	1/15/28	2/4	2/19	3/16	4/2/43	0	13	72	0	16	63	2	74			
	1906/7-19/3/54	45	12/21/27	1/15	1/25	2/2	3/9/31	1/15/28	2/7	2/20	3/16	4/7/43	0	15	84	0	11	61	4	74			
SMAALANDS FARVANDT																							
Agersø Sund Skjelskær Fjord and harbor Omø Sund Karrebekminde, channel to Karrebekminde to Næstved Vejrø, fairway north of Stadgård Bandholm, channel to Bandholm, harbor Sakskøbing approach to Sakskøbing Fjord and harbor Guldborg, north channel Guldborg, harbor Nykøbing, harbor Mønedsund, west channel and harbor Mønedsund, east channel Vordingborg, approach to Storstrømmen Stubbebjerg, approach to Stubbebjerg, harbor Grønsund, eastern entrance Kalvehave to Stage Stage, harbor Bjergø, fairway	1935/36-1933/54	16	1/6/47	1/6	1/24	1/27	2/23/48	1/1/43	2/8	3/6	3/16	4/17/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	43	11/22/25	12/28	1/11	1/27	2/21/36	12/20/33	2/8	2/24	3/13	4/9/42	0	30	36	0	13	32	4	62			
	1906/7-1933/54	43	12/18/27	1/6	1/25	1/27	2/24/36	1/3/26	2/8	3/13	3/16	4/14/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	24	12/27/06	1/7	1/17	1/27	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1935/36-1933/54	16	12/19/38	1/15	1/15	1/27	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1907/8-1933/54	44	12/19/38	1/15	1/15	1/27	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	45	12/11/19	1/14	1/23	1/27	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	45	11/28/15	12/27	1/9	1/23	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	44	11/16/41	12/18	1/15	1/23	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	44	12/20/30	1/10	1/10	1/23	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1936/37-1933/54	15	1/20/30	1/10	1/10	1/23	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	21	12/1/33	12/18	1/15	1/15	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	21	12/1/33	12/18	1/15	1/15	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	45	11/16/41	12/16	1/5	1/22	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	45	12/3/33	12/16	1/5	1/22	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	43	11/17/19	12/17	1/15	1/21	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	43	11/17/19	12/17	1/15	1/21	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	20	1/4/47	1/9	1/20	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	44	11/28/15	12/22	1/9	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	44	12/3/25	1/6	1/20	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	22	1/10/40	1/6	1/20	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	22	12/30/06	1/11/47	1/16	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
	1906/7-1933/54	25	1/11/47	1/11/47	1/16	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62			
1906/7-1933/54	24	11/13/19	12/25	1/8	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62				
1906/7-1933/54	24	12/5/32	12/25	1/8	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62				
1906/7-1933/54	24	11/29/15	12/22	1/9	1/20	2/24/45	1/17/30	2/1	2/21	3/13	4/11/47	0	30	36	0	13	32	4	62				

TABLE 6.—Ice conditions in the western part of the Baltic Sea
(Based on observations made in the winters 1898-97 to 1953-54)

Area of observation	Period of observation	Number of winters		Beginning of ice formations					End of ice formations					Number of days with ice			Shipping conditions during winters with ice					
		Observed	Ice free	Earliest	Early	Average	Late	Latest	Earliest	Early	Average	Late	Latest	Minimum	Average	Maximum	Minimum	Average	Maximum	Number of winters	Highest number of days	
GERMAN COAST																						
Flensburg, outer fjord	1896/97-1933/54	57	35	12/21/45	1/11	1/24	1/30	2/16/52	12/20/5	1/24	2/25	3/25	4/10/42	0	12	91	0	13	47	6	72	
Flensburg, inner fjord	1896/97-1933/54	58	28	11/27/21	1/7	1/20	1/26	2/16/52	12/20/5	1/25	2/21	3/22	4/8/42	0	12	87	0	13	49	11	71	
Schleswunde to Kappeln	1896/97-1933/54	58	4	11/25/02	12/15	1/8	1/26	2/13/25	12/17/33	2/1	2/22	3/14	4/8/42	0	27	106	0	12	49	11	63	
Kappeln to Schleswig	1896/97-1933/54	59	2	12/10/19	12/14	1/30	1/16	2/13/25	12/16/30	2/15	2/27	3/16	4/7/42	0	27	110	0	12	49	24	71	
Wismar, bay and harbor	1896/97-1933/54	57	25	12/10/19	1/4	1/13	1/24	2/22/25	12/16/30	1/27	2/22	3/21	4/7/42	0	15	86	0	16	48	11	44	
Büll, vicinity	1910/20-1933/54	35	24	12/20/25	1/16	1/16	1/29	2/16/54	1/20/25	2/7	3/14	3/17	4/2/42	0	13	79	0	16	33	4	40	
Fredericshof, Rottmann to Laboe	1896/97-1933/54	43	57	11/25/10	1/2	1/14	1/29	2/20/25	1/20/25	2/7	3/17	3/17	4/2/42	0	11	76	0	16	33	0	9	
Kiel, inner harbor	1896/97-1933/54	45	57	12/13/02	1/15	1/21	1/30	2/25/45	1/16/06	2/16	2/18	3/1	4/2/42	0	10	88	0	6	10	0	0	
Marskloog, vicinity of	1896/97-1933/54	57	39	12/13/06	1/11	1/21	1/28	2/22/02	1/24/03	2/16	2/18	3/20	4/15/42	0	10	83	0	6	17	7	57	
Ohlenburg Huk, vicinity of	1896/97-1933/54	57	39	12/13/06	1/16	1/22	1/31	2/13/09	1/24/03	2/23	3/10	3/24	4/20/42	0	11	77	0	12	45	10	46	
Ravennunde	1900/1-1933/54	52	37	12/24/25	1/21	1/21	1/26	2/14/01	1/24/25	1/24	2/22	3/11	4/9/42	0	13	91	0	7	26	7	36	
Ravennunde, vicinity of	1896/97-1933/54	57	27	12/20/21	1/7	1/15	1/25	2/19/31	12/20/21	1/24	2/22	3/11	4/9/42	0	13	91	0	7	26	7	36	
Travemünde, harbor	1896/97-1933/54	56	15	11/20/21	12/25	1/15	1/25	2/12/32	12/21/33	1/25	2/16	3/5	4/2/42	0	14	72	0	5	32	6	28	
Travemünde to Lübeck	1896/97-1933/54	58	10	11/21/02	12/19	1/3	1/23	2/12/32	12/21/33	1/31	2/20	3/5	4/2/42	0	25	105	0	15	33	4	40	
Wismar, farway to	1896/97-1949/50	53	7	11/17/05	12/16	1/3	1/21	2/13/45	12/17/20	1/30	2/25	3/10	4/9/42	0	13	73	0	17	54	3	31	
Wismar to Gedser, southern part	1906/7-1941/42	21	11	12/21/27	1/20	1/20	1/20	2/12/31	1/20/25	2/24	3/6	3/6	4/20/42	0	15	73	0	17	54	3	43	
Wismar, vicinity of	1896/97-1949/50	44	20	11/14/40	12/18	1/14	1/30	2/11/31	1/20/45	1/27	2/24	3/4	4/24/42	0	7	75	0	7	48	5	33	
Wismar, vicinity of	1896/97-1949/50	51	19	11/14/41	12/18	1/14	1/30	2/11/31	1/20/45	1/27	2/24	3/4	4/24/42	0	7	75	0	7	48	5	33	
Wismar, harbor	1896/97-1949/50	53	4	11/15/41	12/14	1/11	1/16	2/12/36	12/17/20	2/15	2/25	3/13	4/7/42	0	14	95	0	25	0	13	57	
Wismar, Warnow River	1896/97-1949/50	53	4	11/15/41	12/14	1/11	1/16	2/12/36	12/17/20	2/15	2/25	3/13	4/7/42	0	14	95	0	25	0	13	57	
Darsner Ort, vicinity of	1896/97-1949/50	52	21	12/13/39	12/31	1/15	1/24	3/2/32	12/22/15	1/24	2/20	3/21	4/24/47	0	15	94	0	9	63	5	67	
DANISH COAST																						
Redby Havn, vicinity of	1911/12-1933/54	40	25	12/20/29	1/6	1/14	2/2	2/20/45	12/25/29	2/20	3/10	3/29	4/25/47	0	15	106	0	14	59	6	26	
Hyllerød, vicinity of	1926/30-1933/54	23	10	12/19/38	12/21	1/20	1/20	2/20/45	12/22/38	2/20	3/13	3/13	4/27/47	0	22	106	0	21	44	8	26	
Nysted, roadside	1906/7-1933/54	4	8	11/17/19	12/21	1/10	1/20	2/22/36	12/14/33	2/4	3/15	3/15	4/14/47	0	25	117	0	25	82	7	31	
Nysted, harbor	1906/7-1933/54	24	2	11/17/41	12/19	1/6	1/10	2/20/45	12/13/33	2/21	3/6	3/22	4/9/47	0	25	115	0	25	82	7	31	
Gedser to Wismar, northern part	1906/7-1941/42	21	12	12/21/27	1/20	1/20	1/20	2/12/31	1/20/25	2/24	3/6	3/6	5/6/42	0	11	85	0	26	58	3	28	
Gedser, vicinity of	1906/7-1933/54	45	25	12/22/58	1/11	1/26	2/3	2/25/36	1/20/25	2/16	3/8	3/23	5/4/42	0	16	104	0	21	104	3	28	
Gedser, harbor	1926/30-1933/54	23	5	12/17/33	1/7	1/21	2/10	2/25/36	12/15/28	2/18	3/7	3/18	4/27/47	0	27	117	0	17	54	3	41	
Heestved, vicinity of	1942/43-1933/54	9	4	12/17/33	1/7	1/21	2/10	2/25/36	12/15/28	2/18	3/7	3/18	4/27/47	0	27	117	0	17	54	3	41	
Møn Light, vicinity of	1906/7-1933/54	45	28	12/30/06	1/13	2/2	2/9	3/11/32	2/6/19	2/20	3/19	4/6	5/5/43	0	13	95	0	15	75	1	66	

to be severe winters; the winter of 1946-47 was considered to be the severest of the past 60 years.

During the very severe winter of 1928-29, the Nord-Ostsee Kanal was closed to shipping for 34 days and the passages between the Baltic Sea and the Kattegat were impassable for some time. In the southern part of the Baltic Sea the currents and winds packed the ice in large masses which could be penetrated only by the strongest icebreakers. Even in March, 1929 the ice conditions were so severe that the assistance of Finnish icebreakers was requested.

The winter of 1939-40 had very severe ice conditions and the open waters were covered with ice. The Nord-Ostsee Kanal from January 19 to March 19, a period of 59 days, was approachable only by the strongest steamers; other vessels leaving the Baltic Sea used the Belts and The Sound. The Sound was closed to shipping for 8 days and Store Bælt was closed for 25 days. The Gedser-Warnemünde ferry suspended service for 32 days from February 11 to March 13 because of heavy ice. On February 9 and 10, the pack ice off the northwest end of Fehmarn was about $8\frac{1}{4}$ feet thick and on March 5, in the same place, the pack ice piled up to a height of about 33 feet.

The winter of 1940-41 was not as severe as the previous winter, but there was sufficient ice to cause some hindrance to navigation. The Gedser-Warnemünde ferry suspended service for about 34 days.

The winter of 1941-42 was as severe as the winters of 1928-29 and 1939-40. During this winter the Gedser-Warnemünde ferry suspended service for about 42 days.

Observations of the ice taken in the years 1939 through 1942 indicated that when very severe cold weather is introduced in January by easterly and, particularly, northeasterly winds, the Baltic Sea westward of Kap Arkona will freeze over completely to the extent that it is navigable only by the strongest steamers.

In recent years (1953-56) it has been noted that ice tends to form at a later date and remains longer than in previous years.

Tables 4 through 6 give statistical data concerning ice formation and navigation.

Figures 16 and 17 present graphically the navigational conditions during severe winters. Figures 18 through 20 show the mean ice cover during the months of January, February, and March.

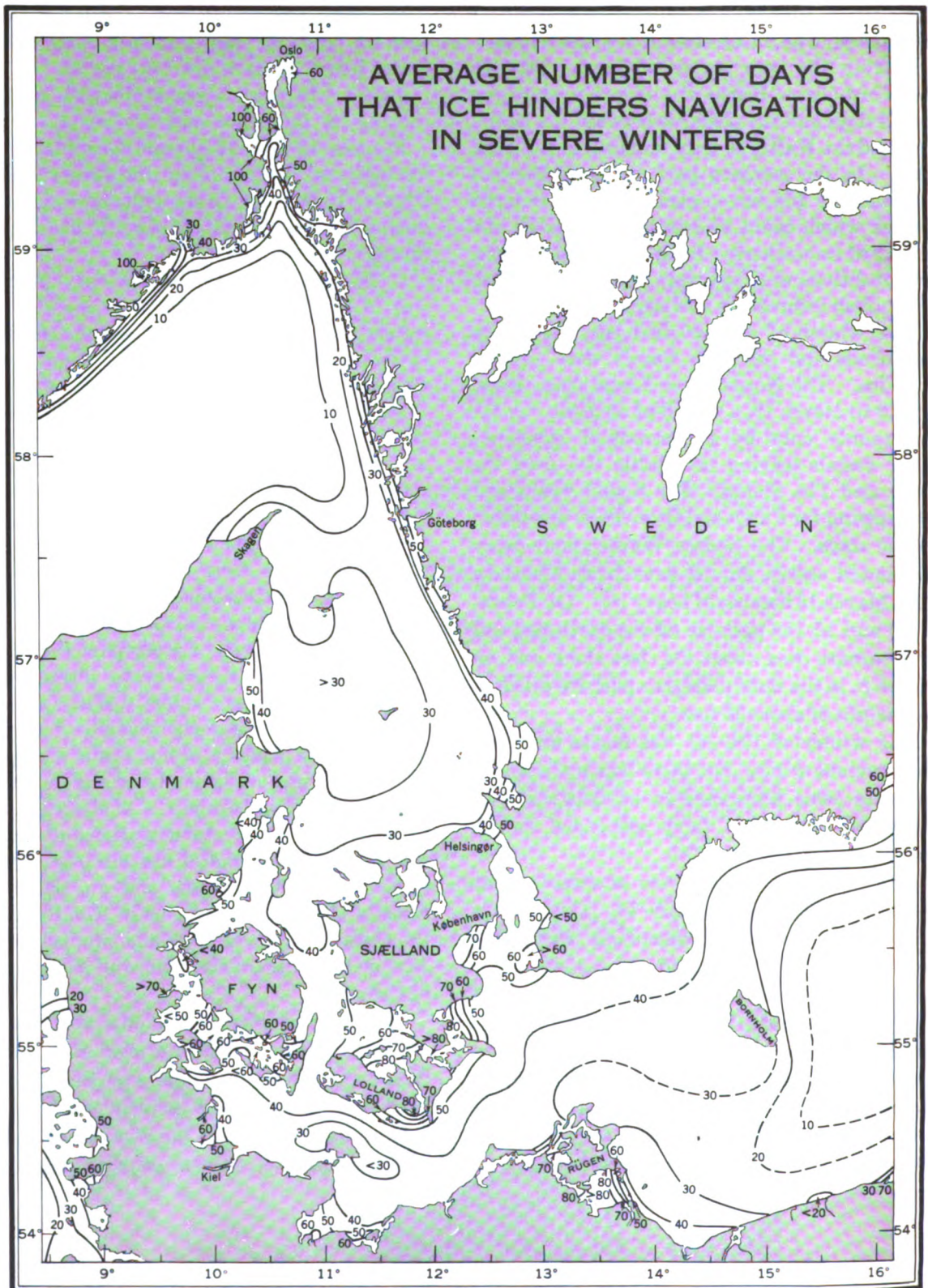
It has been stated that the only practical way of predicting the formation of ice in open waters uses measurements of sea temperatures in the surface layers of water in conjunction with forecasts of surface air temperatures.

1-47 Formation and growth of ice.—The two factors that influence the formation of ice are low air temperatures and the interchange of water between the Baltic Sea and the Kattegat.

A Continental cold wave blankets the countries to the east of Denmark and brings to these waters the frost necessary to form ice. Easterly and northeasterly winds are generally associated with these cold periods.

About 4 to 6 weeks of frost after the middle of September are necessary to introduce ice conditions in these waters. With constant easterly and northeasterly winds ice formation may first take place in the more extensive fjords on the east coast of Jylland and the shoals surrounding Læsø and Anholt. At about the same time, ice forms in the inner waters and shallow channels in Smaalands Farvandet, in the waters southward of Fyn, and in the Belts. Shortly thereafter ice forms in The Sound on the coastal shoals of Sjælland, in København Red, on the shoals of Saltholm and Amager, and in Drogden.

In recent years it has been observed that thin ice forms earlier in the Kattegat than in The Sound and the Belts. This is particularly true with northeasterly and easterly winds, which cause colder weather on the Swedish coast than farther offshore. When strong easterly or



H. O. 141B

Figure 16

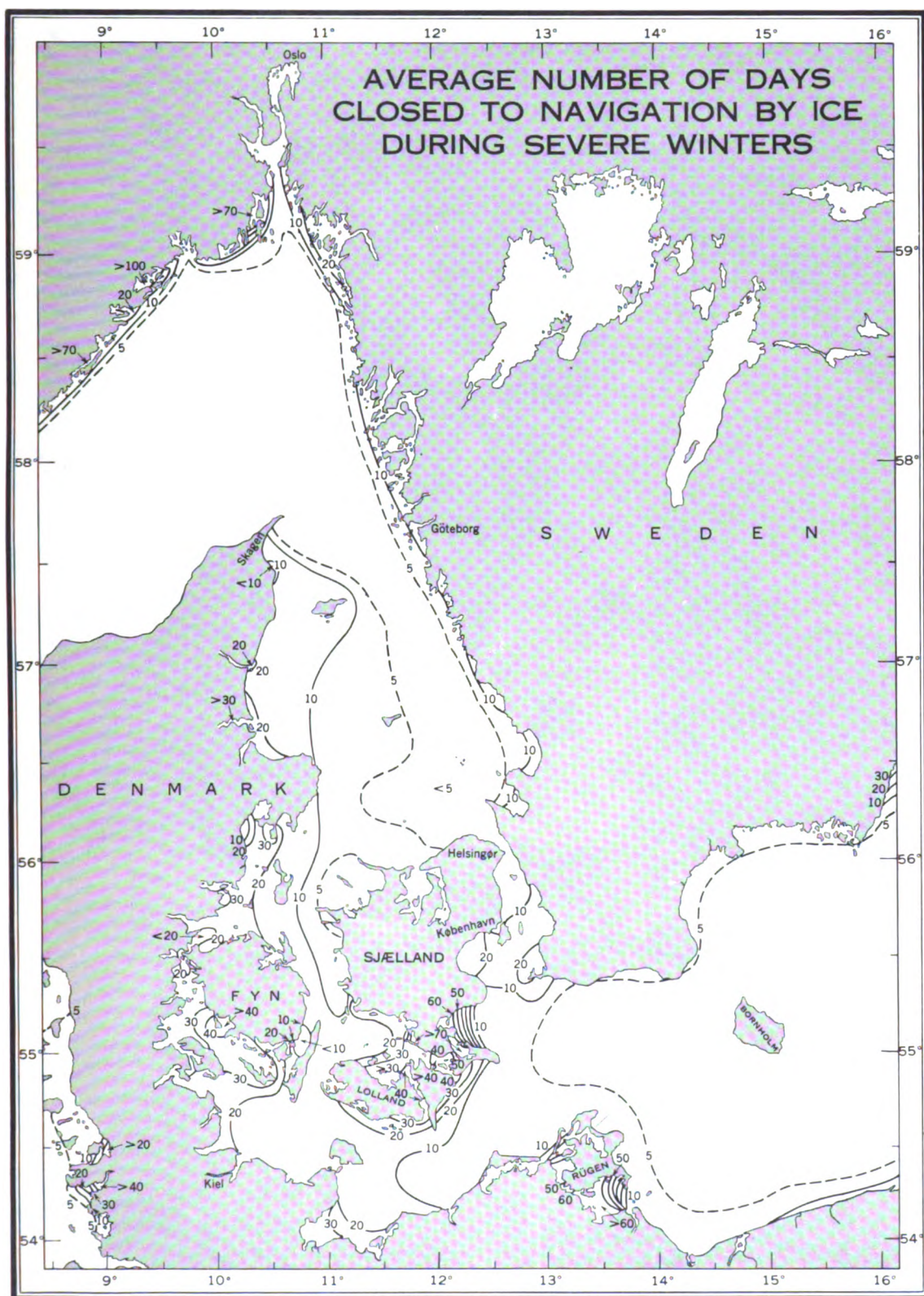
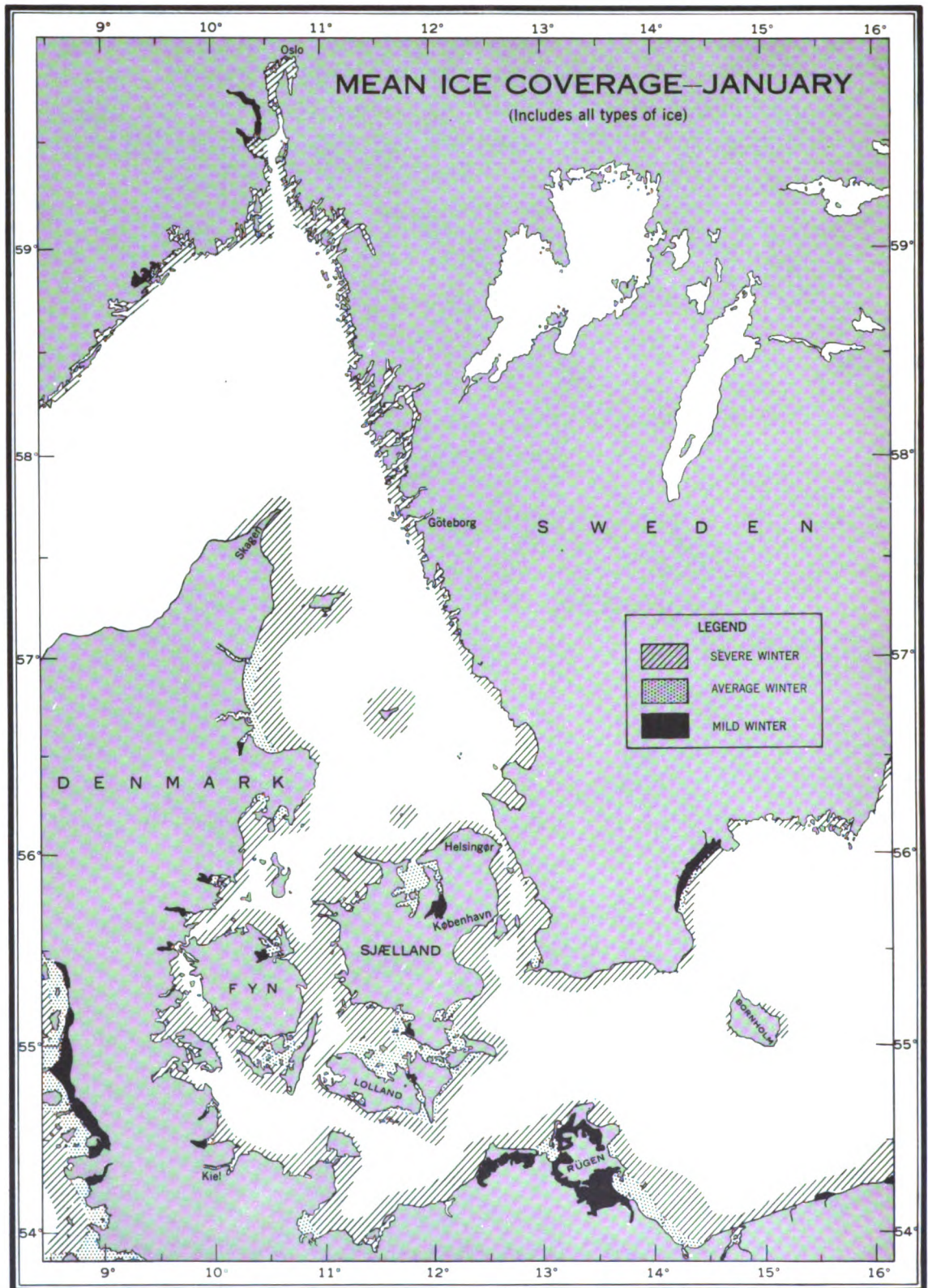


Figure 17

H. O. 141B



H. O. 141B

Figure 18

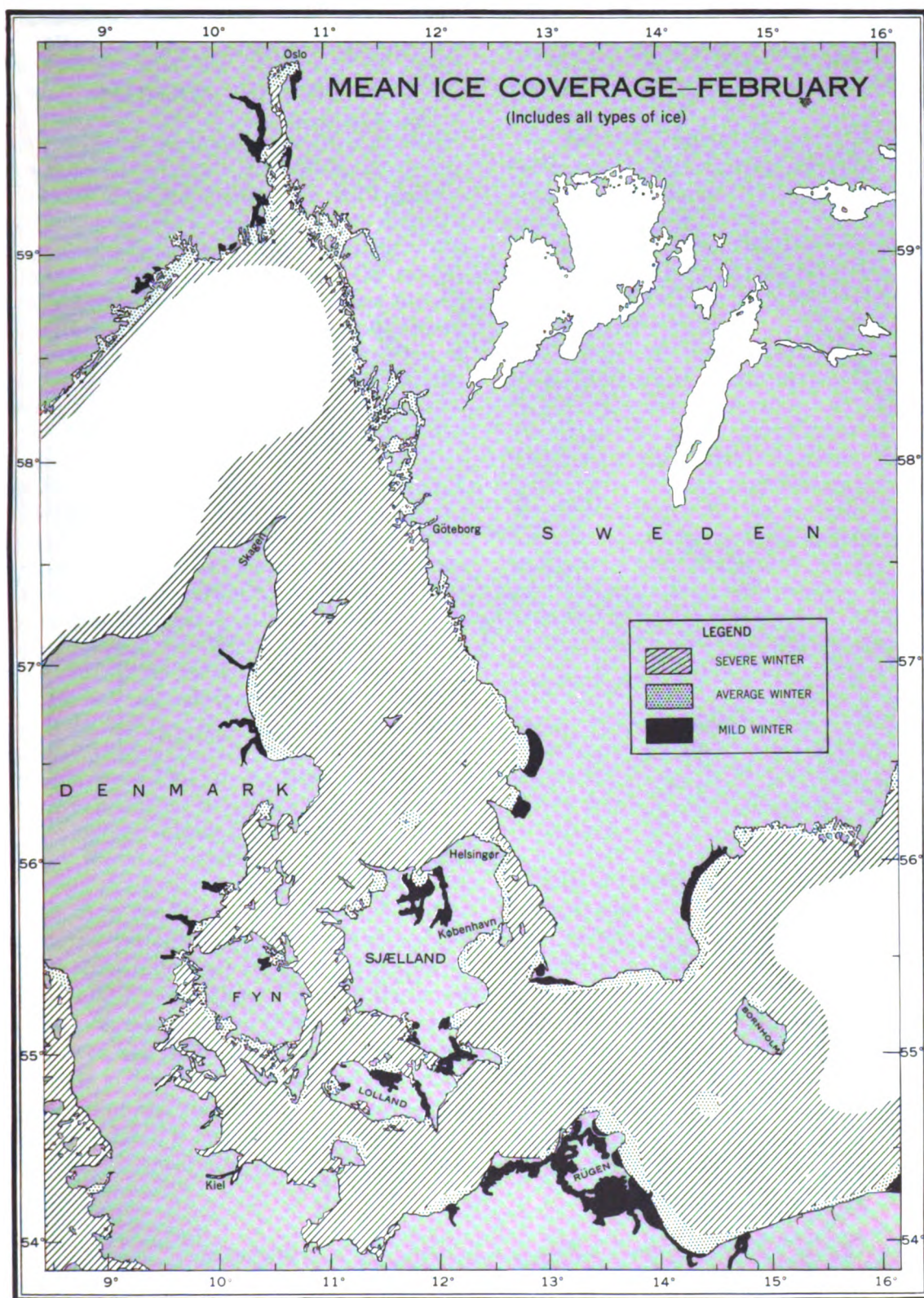
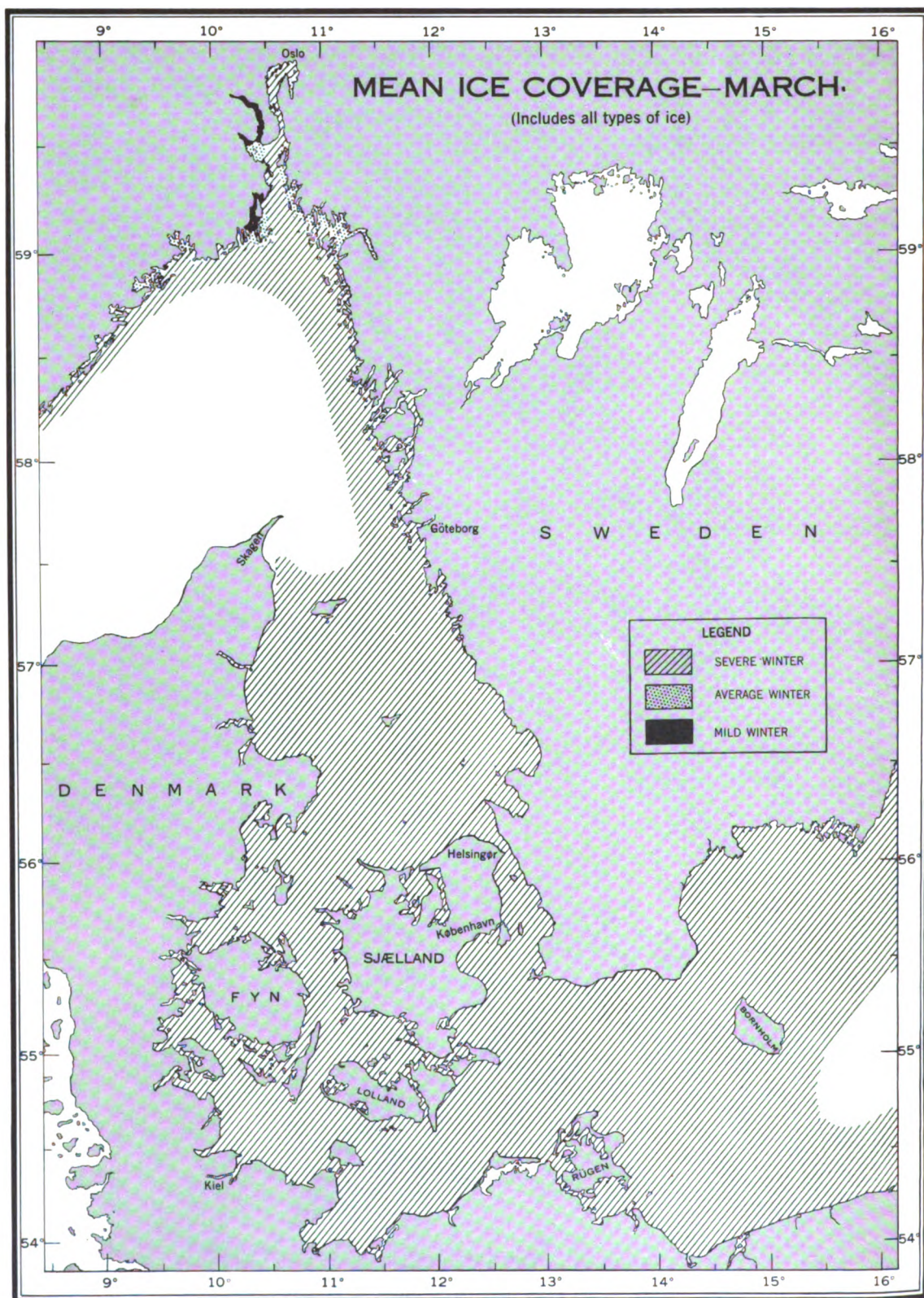


Figure 19

H. O. 141B



H. O. 141B

Figure 20

northeasterly winds have abated, ice forms immediately off the Swedish coast and extends a considerable distance offshore. This occurs more so when there is northgoing current setting for some time so that the fresher Baltic water replaces the upper layer of more saline water that has penetrated from the Skagerrak. The shoal water in Skälderviken and Laholmsbukten together with the fresh waters from the rivers discharging into the bays accelerates the formation of ice in these bays. On several occasions in recent years, thin ice has formed from Kullen to Morups Tånge and Anholt while the fairways in The Sound were clear of ice. After 3 weeks of severe cold weather following the formation of thin ice in the Belts, icebreaker service may be required to keep the channels open.

After thin ice has formed in The Sound, 2 weeks of continuous frost is required for the formation of ice in considerable quantities. Even though masses of ice may be encountered here at this time, strong currents tend to keep the central fairways open and navigation continues between the Kattegat and the Baltic Sea. Following the latter formation of ice in The Sound, an additional 2 weeks of frost is necessary for ice to become present in the eastern and western channels in the Kattegat.

In The Sound and in the Kattegat, frazil ice forms occasionally below the surface layer of water. When this ice floats to the surface and is supplemented by new ice formations and drift ice, navigation is hampered very quickly. When these conditions exist and with a calm night, the Kattegat may freeze over in 1 night.

The above conditions are average; the degree of coldness will lengthen or shorten the stated periods of ice growth. Other factors to be considered are the movement of ice by reason of winds and currents and the breakup of ice by reason of maritime traffic. In summing up the above facts, it may be stated that ice may form in December but it does not last long.

As a rule January and February are the months in which ice may be of most concern to shipping.

The ice in the Kattegat may attain a thickness of 6 feet or more after a protracted period of frost.

In the German and Danish waters in the western part of the Baltic Sea, ice forms in December but it does not remain long. The regular ice does not form until January or February when the easterly winds bring the heavy frosts. With severe cold weather, ice may grow in 10 to 14 days to a thickness that will hinder navigation.

With the introduction of freezing weather, the ice first forms in the harbors and inner parts of the penetrating bays and then along the shallow coastal areas. With continued severe cold weather and after the waters have been cooled to the freezing point the ice formed near the shores begins to extend seaward. Cold weather may be brought by a sudden drop in temperature from the west to the east, but it is generally associated with easterly and northeasterly winds. Ice forms most rapidly when there is calm weather during a period of continuous severe frost.

Snowfall accelerates the formation of ice, not only near the shores and in the bays but also in the open waters. Snow falling during a protracted period of cold weather covers the waters with a slush which quickly freezes over completely.

1-48 Movement of ice.—There is much movement of ice in the waters described in this volume even though most of the ice formed here is fast ice. This may be attributed to 3 factors; (1) winds from all quadrants, (2) changes in water levels, (3) surface currents. The intermittent periods of warm weather during milder winters contribute to the temporary disintegration of ice and consequently facilitate the breakup of fast ice and the previous packing of ice along the shores, on the shoals, and off the harbor entrances.

Easterly and northeasterly winds, which are accompanied by severe frost, drive ice from the Baltic Sea into the Belts and The Sound and thence into the Kattegat. Easterly winds in the Kattegat tend to move the ice westward from the Swedish coast. Westerly winds accompanied by mild weather are one of the causes of the breakup of ice. Once the ice begins to drift, westerly and northwesterly winds carry this ice toward the Swedish coast. If westerly winds back to a southerly direction the ice masses are carried from the Kattegat into the Skagerrak.

The northward drift of ice from the Baltic Sea into The Sound is accelerated by the northgoing current in The Sound. This ice continues northward into the Kattegat, favoring the Swedish coast, and may continue onward toward the Skagerrak. In the vicinity northward of Laholmsbukten this northerly ice movement is augmented with additional drift ice from the Belts. This ice from the Belts is carried by a northgoing current which upon reaching Anholt is deflected eastward to join the northgoing drift from The Sound. Consequently there is a tendency for the ice to pack between Anholt and Morups Tånge, particularly near the Swedish coast. Farther northward, off Pater Noster Skären, the ice is also liable to pack since the current here, for the most part, sets toward the Swedish coast.

Once the ice has begun to break up and there is a continuation of westerly and northwesterly winds the northerly advance of ice off the Swedish coast is somewhat retarded. This causes the ice to pack to the extent that the northeastern part of the Kattegat may be the last to be cleared of ice.

The ice situation at the entrance to The Sound is variable, even in periods of heaviest ice, since a change in wind and current may open a channel at one time and shortly thereafter close it. During spring, drift ice may hamper navigation in the vicinity of Helsingør

where ice may pile up in great thickness, frequently 6 feet and more. However, this may be broken up by strong westerly winds, mild weather, and high water level.

In the western part of the Baltic Sea, the effect of the winds and currents on the movement of ice is to scatter it, pile it up in large masses on the shore, or consolidate it into small icefields in the open waters. Northeasterly winds break up the ice in the open waters and drive it into the fjords and bays. Long-lasting easterly winds cause severe ice conditions, which necessitate the removal of lightships for weeks at a time. Some of the ice packs formed by the action of the wind and current can be penetrated only by the strongest icebreakers.

Disintegration of ice.—In general, Store Bælt and the Kattegat become navigable about the same time, and The Sound is sometimes filled with ice for a week or longer after the Kattegat is clear. There have been instances when the Belts were closed to navigation when a channel was still open in The Sound.

In Store Bælt after 5 to 7 days of mild weather the ice begins to break up and navigation becomes possible.

Ice begins to break up and disintegrate with the arrival of westerly storms that bring in the warm and moist air and cause high water levels. The ice on the central shoals is now raised and drifts out to sea. When this occurs, and within a period of about 3 or 4 days, the west channel in the Kattegat may be ice free. There have been instances, however, when strong southwesterly and westerly winds have blown for 2 days without clearing Læsø Rende. The northern part of this channel was free of ice, but the fairway between Søndre Ronner and the Danish mainland remained closed by an impassable ice barrier. An additional 2 days of westerly winds are required to clear this barrier, at which time the fairway through Læsø Rende and Aalborg Bugt was opened. Sometimes a west wind drives the floating ice toward the

Swedish coast and opens up the west channel and the harbors on the Jylland coast.

The time it takes to clear the ice in the Kattegat in the above-described manner depends on the ensuing weather conditions. If a westerly storm that generates the first movement of ice is followed by southerly winds with rain and fog the ice will disintegrate rapidly and drift in to the Skagerrak. However, if westerly winds continue, or if they alternate with easterly winds, it may take several weeks for the Kattegat to become free of drift ice.

Ice formation in The Sound will usually cause the greatest navigation difficulties along the coast of Sjælland. The ice situation in the northern entrance of The Sound is described elsewhere. When ice has formed solidly between Ven and Sjælland, it is not uncommon that on breaking up it will drift in the form of large floes that present a serious concern to navigation.

Drift ice from the Baltic Sea may pass through The Sound long after the local ice has disappeared.

SEA AND SWELL

1-49 Frequency of sea and swell heights by direction for open water areas are presented in figure 21. The percentages shown are averages of sea and swell conditions that have been observed over the designated areas.

The seas of this region, predominately westerly in direction, are generally slight to moderate in height with only 10 to 15 percent of those observed over 8 feet high. There is only a slight reduction in the frequency of seas 8 feet and greater from winter to summer. In general, the highest seas occur when the strongest winds are oriented approximately in line with the longest generating fetches, i. e., along a north-south axis in the Kattegat and along an east-west axis in the southwestern part of the Baltic Sea.

Swell data are sparse for the Belts and the extreme southwestern Baltic, but in these confined waters, swell is probably of little importance. The northern portion of the region, where the greatest swell is observed, is dominated by southwesterly and westerly swell from the North Sea, whereas northeasterly swell prevails over the southern portion during both summer and winter.

Ice which constricts the narrower passages in this region during severe winters dampens the waves and shortens fetch distances with resulting lower waves.

CLIMATOLOGY ¹

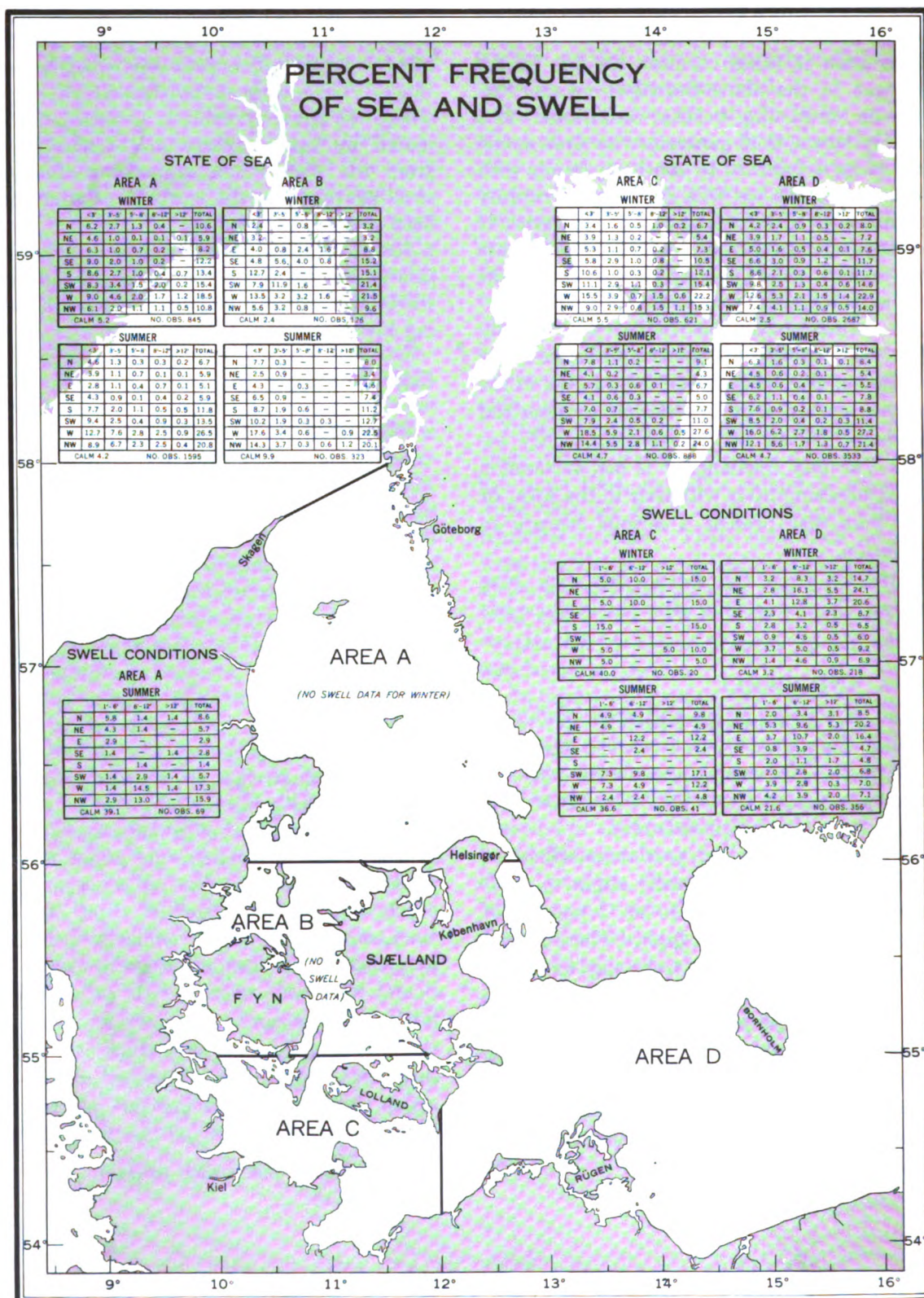
GENERAL REMARKS

1-50 The area of the Kattegat, the Belts, The Sound, and the waters leading to the Baltic Sea has a humid temperate climate because of the relatively warm maritime air masses. However, lack of mountain barrier enables cooled air to spread westward from Russia and produce periods of cold winter weather. These waters are remarkably mild considering the latitude; on the west coast of Sweden the average annual temperature is about 45° F. The short summer is counterbalanced, to a great extent, by the length of the summer days and their abundant sunlight, both having a considerable influence on animal and vegetable life.

Snow falls over all of Sweden every winter. In the south it remains only about 50 days, while at Göteborg it lies on the ground for nearly double that period of time. In Denmark, snow does not lie regularly or for such long periods. During some severe winters The Sound has been covered with ice sufficiently thick so that it can be driven over in cars.

Since this area lies in the track of low pressure areas, the winds and weather are variable. As an instance of the changeable nature of the climate, the navigation of the Belts in some

¹ Prepared by the U. S. Weather Bureau.



winters is stopped for months by ice, whereas other winters are quite open.

Easterly gales, when they occur, bring sudden changes in the weather, with severe cold in winter and dry heat in summer. A northwest wind, known as "skaj", which is experienced in spring, is said to be trying to human, animal, and plant life.

The middle and north sections of Jylland are generally the coldest, with coastal areas averaging about 1° F. warmer than the interior. The mean annual temperature varies between 43° and 47° F., with the mean temperature of winter 32°, of spring 42°, of summer 61°, and of autumn 47° F.

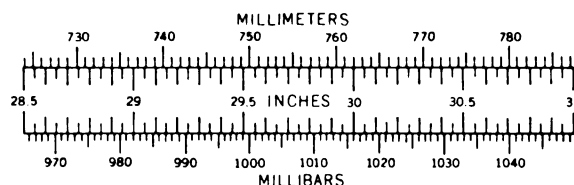
The yearly average rainfall is about 20 inches in the south, increasing to 25 inches in the north; most rain falls with west and southwest winds. A dense summer mist, known as "havgusen" or sea fog, is common on the coasts. At maritime stations the greatest rainfall occurs during the latter part of the summer. In the southern part a secondary maximum occurs in July or August, with least rainfall February to April. Thunderstorms may occur at any time of the year but are most frequent in summer between May and August. Hail is most frequent in spring and autumn.

Along the coasts, land and sea breezes affect the general wind system so that the wind experienced is often not the one which would be expected from the pressure pattern. A weak pressure gradient, sunny days, and clear nights are favorable to the development of the land and sea breezes which are strongly influenced by topography. During the day a sea breeze tends to blow onshore and reaches its maximum development in the afternoon with a light offshore wind; the land breeze may spring up after 2200 and last until morning. Land and sea breezes are caused by unequal heating of the land and water. In quiet high pressure conditions the land and sea breezes may be the dominating winds. The effect of the land and sea

breezes does not extend much beyond 10 miles inland and occasionally may be felt as much as 20 miles seaward from the coast.

PRESSURE

1-51 In the Hydrographic Office publications atmospheric pressure is expressed in inches, but as both millimeters and millibars may be used in other publications which the navigator may have occasion to consult, the following diagram is inserted to facilitate conversion.



Since traveling depressions pass frequently through this region, there are large day to day changes in pressure. Most of these low pressure disturbances approach from the west and southwest and travel in a northeasterly direction. Winter is characterized by deep depressions while in spring and summer they are shallow. During winter, pressure is usually lower to the northwestward of this region and is higher over the Continent. In spring, pressure usually decreases over the Continent, resulting in a slight average pressure gradient in this area. Average summer pressure increases from north to south but by October it is again increasing from northwest to southeast. The diurnal variation of pressure is small, being masked by larger irregular changes from the traveling pressure systems. For example, the average daily range at København is only about one-half millibar.

During the winter months the centers of low pressure areas pass near Iceland and often the frontal systems are occluded so that the pressure cell is elongated northwest to southeast when they pass through this region.

Average values of the pressure for each month at a number of stations are given in the appendix.

WINDS

1-52 This region lies in the path of low pressure disturbances, therefore the winds blow from different directions as these disturbances pass. However, as the depressions more often move to the northward than southward, prevailing winds are from the southwest and west, especially in the early winter. During spring, northerly and easterly winds are frequent while in summer westerly winds prevail, and in October the southwesterly winds again begin to increase. When a high pressure cell exists over northern Russia or Scandinavia, with lower pressure to the south, easterly winds will blow over this region. Such a high is often persistent, especially in the latter part of winter when it brings periods of very cold weather. This high pressure distribution brings fine sunny weather in summer. Northwesterly winds tend to prevail in June when pressure is high over the British Isles and lower over eastern Russia. This northwesterly wind may be squally with cool weather. Locally the wind tends to blow parallel to the coast, thus the average direction becomes more westerly at Skagen and more southerly through The Sound and into the Baltic Sea. The frequency of the winds from the different directions for this area expressed in percentage is as follows:

N	NE	E	SE	S	SW	W	NW	Calm	Total
8	8	9	11	15	17	18	11	3	100

The strongest winds are the west and northwest winds, blowing with greater strength in autumn and winter than in spring and summer. The stormiest month is December.

GALES

1-53 Gales are caused most frequently by low pressure systems passing near or through this area which generally approach from a

westerly direction and move in some direction between northeast and southeast. Since in winter these depressions are deeper and more extensive, gales occasionally blow over large stretches of these coasts mostly from directions between northwest and southwest. Of the barometric depressions passing over this locality and affecting its weather, the centers of about 70 percent pass northward and only 30 percent southward of Denmark; in the winter months the number passing northward is at its maximum.

If a wind starts from the southeast and the center of the low is passing northward of the observer, the wind will veer from southeast through south and southwest to west or northwest. If the center is passing southward of the observer, the wind will back through east and northeast to north.

Since the British Isles are directly in the track of these disturbances, these waters are in a favorable position for acquiring an early warning of the approach of gales. Secondary disturbances often form in the Skagerrak and travel in an easterly direction; they may cause southerly or westerly gales on their southern sides.

The average number of days with gales (winds blowing 28-33 knots and upward) for the whole of Denmark for 1 year is 45, these occurring in the following proportions, according to the season: In winter, 17; spring, 8; summer, 6; autumn, 14. Gales tend to be stronger in the Skagerrak and in the entrance to the Baltic Sea than in the Kattegat and narrower waters of The Sound and Belts.

AIR TEMPERATURE

1-54 Although winters generally are not severe, cold spells may occur with easterly winds, bringing cold air from interior Continental areas. During January and February the average temperature is near the freezing point while in December and March it is slightly

higher. Only about 1 year in 4 or 5 does the temperature remain below 32° F. for as much as 14 days. The average temperature at Göteborg is below freezing from late December to early March. On about 110 nights a year, the minimum temperature is below freezing on the west coast of Sweden and on about 25 days the highest temperature is below freezing. On the Danish and German coasts the minimum temperature is below freezing 70 to 90 days a year. Early spring may be cold, but temperature increases rapidly in May and June. The warmest months are July and August with average temperatures a little over 60° F. and daily maxima between 65° and 70° F. Of the three coasts the Danish is coolest.

In the winter months the average air temperature is about 1° to 3° F. lower than the water, from March to August about 0° to 2° higher, slightly lower in September and October, and 3° lower in November.

CLOUDS

1-55 Since this is a region of traveling disturbances in winter, there is much low cloud associated with them so that overcast days are more frequent in the winter half of the year. Conversely, clear days are more frequent in summer. However, clear days are rather few, averaging from 35 to 45 a year, whereas there are from 120 to 170 overcast days. Cloud cover reported from the coastal stations averages seven- to eight-tenths in winter and falls to about five-tenths in May; in summer it averages between five- and six-tenths. The average diurnal variation is small. At Skagen, maximum cloudiness occurs with winds from east to southwest and clearer skies with those from west to northeast.

PRECIPITATION

1-56 Distribution of rainfall is fairly uniform throughout the year, with July to October the rainiest and February to April the driest

months. The heaviest rainfall may occur in any month but is least likely in the months of February to April. Most rain falls with southwesterly and westerly winds.

The average annual rainfall is approximately 25 to 30 inches on the Swedish coast north of Göteborg, decreasing southward to 20 inches at Malmö. About 22 to 25 inches is the average fall in Denmark and Schleswig-Holstein.

In late November or early December the south coast of Sweden generally becomes snow covered and remains so with only occasional intermissions until March or early April. Although individual winters vary considerably, the average duration of snow cover is from 50 to 60 days. During the winter, snow falls on 30 to 40 days in southern Sweden. Between November and April, but occasionally in October and May, snow falls on from 20 to 30 days a month in Denmark and Schleswig-Holstein.

Any month may bring hail but in the average year it falls on from 1 to 12 days over coastal regions. It is frequent in spring and autumn. Thunderstorms are frequent between May and August with thunder heard on the average from 8 to 15 days a year.

VISIBILITY—FOG

1-57 Fog and poor visibility are more prevalent during the winter months than during the summer months. Advection fog or sea fog may form during the winter in the warm sector of a depression when relatively warm southwesterly winds blow over colder water. Fog is likely to be present near melting ice. Patches of sea fog may be prevalent during the winter because of the freezing and thawing of ice. Falling snow may also be an obstruction to visibility. In cold, calm weather, radiation fog may develop over the land and obscure the coasts or drift over the sea near the coasts. Such circumstances may hide coastal lights and landmarks while good visibility may prevail at sea.

Sea fog may also form in spring and early summer, when the average sea temperature is below that of the air, because of land-heated air blowing over the cooler waters. In summer, a sea mist known as "havgusen" occurs on the Danish coasts. If heating is strong enough, all types of fog may dissolve. This would make fog frequency more likely during the morning than

during the afternoon. Good visibility is more likely to occur during the summer months. However, March is the month in which observations of exceptionally good visibility is most often noted.

Observations indicate that the foggiest months are October through March in most regions. Fog data is given below.

TABLE 7.—Average number of days with fog or mist

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Number in year
Kalundborg.....	10	10	8	4	2	1	1	1	3	7	8	10	65
Assens.....	5	4	4	2	.5	.3	.3	.5	1	2	2	4	25.6
Gedser Rev.....	8	7	6	5	3	2	1	1	2	3	4	6	48
Schleswig.....	5.7	4.5	3.8	1.6	.9	.2	.6	1.6	3.5	5	6.1	6.3	39.8
Wismar Bucht.....	5.3	3.9	3	1.9	.7	.4	.2	.7	1.4	4.1	5.3	5.7	32.6

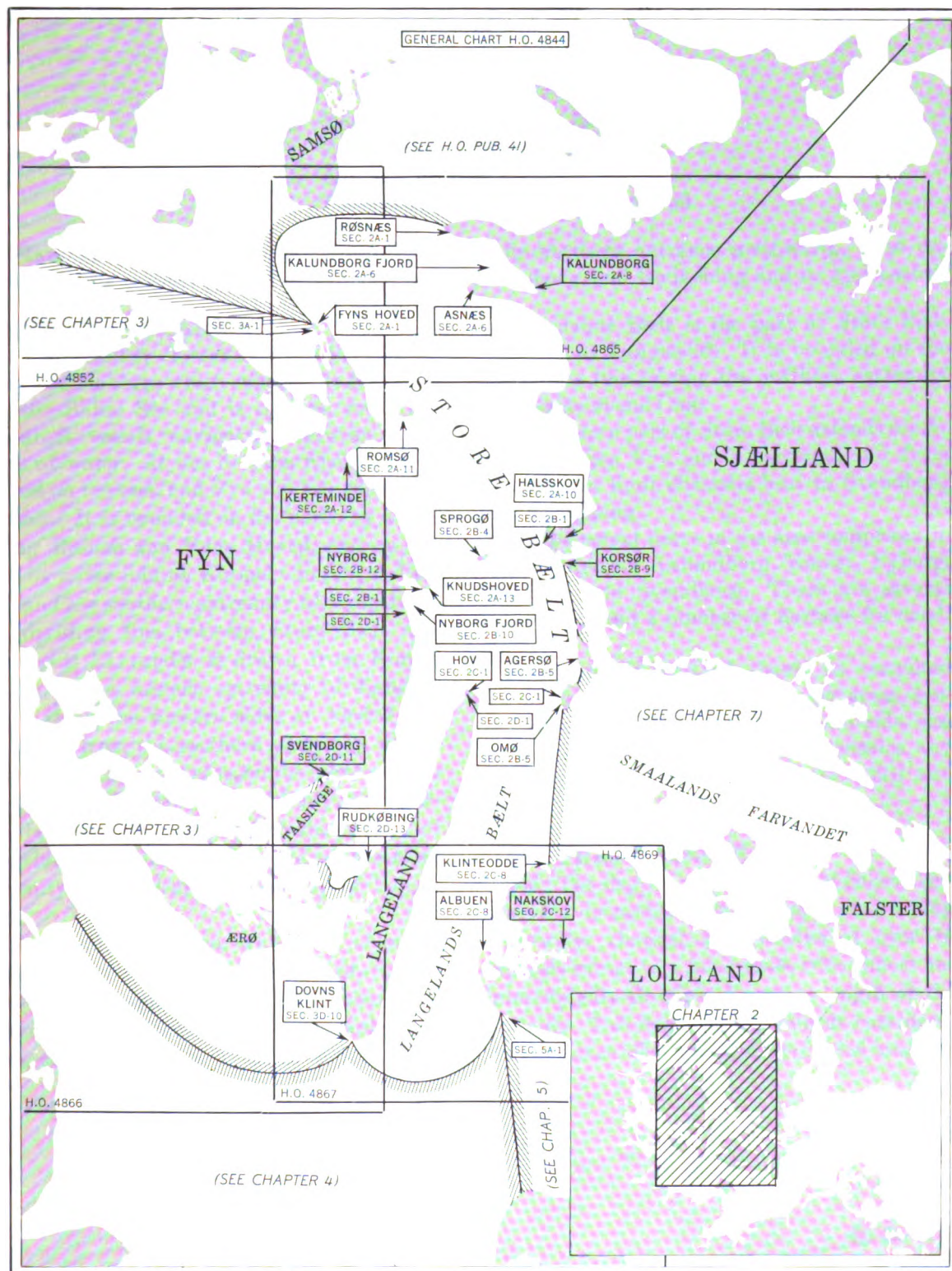


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
 Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 2—GRAPHIC INDEX

CHAPTER 2

STORE BÆLT

- Part A.** Northern Part of Store Bælt
- Part B.** Central Part of Store Bælt
- Part C.** Langelands Bælt
- Part D.** Passage between Fyn and Langeland

Plan.—This chapter describes Store Bælt from its northern entrance southward. Also described are the eastern part of Svendborg Sund, Svendborg, and Rudkøbing and its approaches.

GENERAL REMARKS

2-1 Store Bælt (Great Belt) is the central passage of the three which connect the Kattegat with the Baltic Sea and is the best route for deep-draft vessels navigating between these bodies of water. It lies between Sjælland and Lolland on the east, and Fyn and Langeland on the west. It is bounded on the north by a line joining Røsnæs and Fyns Hoved, and on the south by a line joining Kappel Church, on Lolland, and the southern extremity of Langeland. The dividing line between Store Bælt and Smaalands Farvandet is drawn from Korsør Church to the western extremity of Egholm, thence along the western sides of Agersø and Omø, and from the southern extremity of the latter island to Klinteodde, on the northwestern side of Lolland. The southern limit of the passage between Fyn and the northern part of Langeland is a line joining the southeastern extremity of Turø and Næshoved, on Langeland.

The island of Sprogø, which lies about 25 miles southward of Røsnæs, divides Store Bælt into two passages named Østerrenden and Vesterrenden. Channels through both these passages are navigable by large vessels.

Langelands Bælt is the part of Store Bælt eastward of Langeland. It is bounded on the north by a line joining the northern extremity of Langeland and Omø.

The western part of Store Bælt extends southward between Fyn and Langeland, and from its southern limit channels lead to Svendborg and Rudkøbing.

The principal ports in the area comprised in this chapter are Kalundborg, Korsør, Nyborg, Nakskov, and Svendborg. There are several lesser ports and a number of harbors for small craft.

Caution.—NEMEDRI should be consulted for information concerning danger areas, special routing, temporary navigational aids, and related subjects. NEMEDRI supersedes any "Directions" given in this chapter. See also section 1-41.

DEPTHS—CHANNEL

2-2 The depths in most parts of Store Bælt are very irregular. Dybe Rende, a winding deep-water channel with depths of over 15 fathoms except in a few places, runs almost uninterruptedly through the entire length of the passage. This deep channel affords considerable assistance when navigating in thick weather.

In clear weather a vessel can pass through Store Bælt in a least depth of 7 fathoms without following all the convolutions of Dybe Rende.

The depths in Dybe Rende exceed 27 fathoms in only three places, these being located respectively about $2\frac{1}{2}$ miles westward of Røsnæs, in Østerrenden, and about $3\frac{1}{2}$ to $4\frac{1}{2}$ miles southward of Spodsbjerg. From abreast Stavreshoved to within about 2 miles of the northern entrance of Østerrenden the depths in the greater part of the fairway are about 11 to 15 fathoms.

Dybe Rende passes about 2 miles westward of Røsnæs and then trends south-southwestward to a position about 6 miles westward of Asnæs. Thence it trends south-southeastward toward Østerrenden, passing eastward of Ryggen and between Elefantgrund and Romsø; eastward of Stavreshoved the continuity of this part of the deep channel is interrupted by the shoaler depths mentioned above.

From Østerrenden, Dybe Rende passes close eastward of Vengeancegrund and then turns southwestward; a branch extends through Omø Sund. After rounding Vengeancegrund the main channel divides into two branches. The eastern branch trends southward and the western branch trends southwestward to a position about 1 mile eastward of Hov and then turns southward. The two branches reunite about 5 miles south-southeastward of Hov Light, and thence the channel trends southward to a position about $4\frac{1}{2}$ miles eastward of Tranekær Light. From the latter position the channel takes a west-southwesterly direction to a position about 1 mile eastward of Spodsbjerg and then follows the east coast of Langeland southward at a distance of 1 to 2 miles offshore.

The width of Dybe Rende varies from about 200 yards to 1 mile.

BOTTOM

2-3 The bottom in Store Bælt consists mainly of clay, which is covered in some places

by a thin layer of rather fine sand, or occasionally gravel; this layer usually increases in thickness as the shore is approached. On many of the shoals and patches there is a considerable amount of rock imbedded in the clay. Close to shore there is frequently a belt of clean white sand with some grass, which increases in amount farther offshore and is gradually replaced by weed.

The holding ground is good in nearly all parts of Store Bælt, but the nature of the bottom does not afford much information for determining the position of a vessel by the use of the lead. In large areas, especially between Romsø and Sprogø, the clay of the bottom is so stiff that it does not adhere to the arming, and in some parts of the fairway, specimens of clay may have the consistency of mud, which may occasionally be mixed with a few grains of sand or gravel. The only information of navigational value that can be deduced is the fact that mud is frequently found in Dybe Rende and its vicinity, whereas sand is usually picked up nearer the shore and on the shoals.

TIDES AND WATER LEVEL

2-4 The range of tide in Store Bælt is negligible.

Information concerning the changes in water level at various ports and harbors in the area comprised in this chapter is given in the descriptions of the places.

CURRENTS

2-5 Because of the variable nature of the currents in Store Bælt, it is impossible to predict with certainty the direction in which they will be setting. In general it can be assumed that a northgoing current prevails when the wind is from north-northeast through east to west-southwest, and a southgoing current is prevalent only when the wind is between west and north-northeast; northwesterly winds nearly always cause a strong southgoing current.

Although the northgoing current predominates, it seldom occupies the whole width of Store Bælt; usually the current is northgoing on one side and southgoing on the other side. At times there is a northgoing current on each side of the passage and a southgoing current of varying width between them. The adjacent edges of these opposing currents are indicated by rips, and are frequently marked by foam and seaweed; they are not constant, but depend on the velocities of the currents, the difference in water level on the opposite shores, and other factors.

The direction of the current is determined to a considerable extent by local conditions, but it is not constant at any given place, even though conditions appear unchanged. The current, either northgoing or southgoing, sets in a different direction at its commencement than after it has been running for some time. After running for about 12 hours the main current is usually following the direction of Dybe Rende. Irregularities of the bottom and other local conditions may deflect the current in places, and undercurrents are also causes of diversion. An example of local conditions is the tidal current which sets through the harbor entrance at Korsør (sec. 2B-9); this deflects the main current in Store Bælt well outside the harbor and beyond Halsskov Rev.

The larger irregularities of the bottom in Store Bælt are usually indicated by overfalls which frequently appear on the side of a shoal opposite to that toward which the current is setting. These overfalls, which should not be confused with the rips previously mentioned, sometimes give warning of underwater dangers, but they may also occur in the deeper parts of the fairway as, for instance, in a place where the depth decreases abruptly from about 16 fathoms to 8 or 10 fathoms.

The velocity of the current depends on the width and depth of the fairway, and it is also affected to some extent by the tidal currents.

In the narrower and deeper parts of the fairway the velocity increases, and it is greatest in Dybe Rende. A danger to be guarded against is the possible increase in the velocity near detached shoals and reefs, over which the direction of the current may vary according to the formation of the bottom. Even in calm weather and under apparently settled conditions the rate of the current in Store Bælt may be as much as 3 knots.

The southgoing current is the stronger in Vesterrenden and the northgoing current is the stronger in Østerrenden. In places where the coastal banks are steep-to, both currents produce countercurrents which can be utilized by vessels having local knowledge. The strongest countercurrents are along the coast of Fyn between Kerteminde Bugt and Knudshoved, and, especially with a northgoing current, along the coast of Langeland between Tranekær and Gulstav; the eastern side of the latter countercurrent is frequently marked by strong rips. Along the west coast of Lolland there is a fairly strong countercurrent extending offshore to a depth of about 4 fathoms.

Southgoing current.—From the northern entrance of Store Bælt the southgoing current follows the direction of the fairway south-southeastward and passes on both sides of Elefantgrund. The greater part of the western branch passes between Elefantgrund and Romsø, and thence sets southward toward Vesterrenden, where it is divided by Sprogø, one part setting southward on the western side of Østerrenden and the other setting through Vesterrenden. Another part of the current westward of Elefantgrund sets through the passage between Romsø and Fyn, across Kerteminde Bugt outside the depth of about 9 fathoms, and then follows the Fyn coast outside the 5-fathom depth to Knudshoved; only a small portion of this part of the current sets along the shores of Kerteminde Bugt.

After the current from the northern entrance of Store Bælt bifurcates at Elefantgrund, the eastern branch passes between that shoal and Lysegrunde and then sets southward to Østerrenden, passing close westward of Musholm and thence toward the northwestern side of Halskov, off which it turns southwestward and rounds Halsskov Rev.

The current westward of Sprogø keeps mainly to the western side of Vesterrenden and sets from Knudshoved toward Vresen Puller, where it divides. A weak branch passes between Vresen and Fyn and extends as far southward as Turø; with strong westerly winds a portion of this current sets eastward through Kobberdyb. Strong northeasterly and easterly winds cause large quantities of the water passing through Vesterrenden to be forced into the passage between Fyn and Langeland. The main part of the current through Vesterrenden passes eastward of Vresen Puller and sets across Broen, where it is influenced to a considerable extent by the wind. Strong westerly winds force the water from Vesterrenden so far eastward that the current crosses the entire width of Broen to the western side of Vengeancegrund, from which it sets toward the flats bordering the western side of Omø and then continues southward.

A branch of the current which sets around Halsskov Rev passes through Agersø Sund; the remainder of this current sets along the western sides of Agersø and Omø.

The current from Østerrenden sets through the narrow channel between Vengeancegrund and Agersø Flak, and thence past the flats extending from the western side of Omø. With strong northeasterly and easterly winds this current passes some distance westward of Omø.

Southward of Broen the combined current follows the general direction of the fairway, attaining its greatest velocity in Dybe Rende. The comparatively shoaler portions of the bot-

tom in Dybe Rende cause the current to divide as it sets across them.

Northgoing current.—In general, the northgoing current through Store Bælt, like the southgoing current, follows the direction of the fairway. It sets toward Næbberevler, on the eastern side of Langeland, with considerable strength. It crosses Broen in a northerly direction, its western portion passing close to Hov Sand, eastward of Vresen, and through Vesterrenden. The current across the central part of Broen sets directly toward Sprogø, but southward of that island it is divided by Gællegrund into two branches which pass respectively eastward and westward of Sprogø. As the northgoing current passes across Broen its direction is affected by strong winds in the same manner as the direction of the southgoing current.

Between Fyn and Langeland there is a weak northgoing current which passes westward of Vresen and continues northward to a junction with the current setting through Vesterrenden off Knudshoved.

The eastern portion of the northgoing current crosses the flats westward of Omø and passes through the channel between Agersø Flak and Vengeancegrund. Northward of Egholm it is joined by the current from Agersø Sund, and the combined current, together with the eastern branch of the current which divides at Gællegrund, then sets through Østerrenden.

After setting through the passages on either side of Sprogø, the current continues northward, passing on both sides of Elefantgrund. Like the southgoing current, the northgoing current is not strong in Kerteminde Bugt.

WINDS AND WEATHER

2-6 See section 1-50.

ICE

2-7 The formation of ice in Store Bælt follows the freezing over of Smaalands Farvandet. Ice in the passages eastward and westward of

Sprogo is nearly always in motion. The ice in Nyborg Fjord and in the passage between Langeland and Fyn remains longer than that in other parts of Store Baelt. When the ice in the western part of the Baltic Sea breaks up, large masses of it frequently drift northward through Store Baelt. See chapter 1 for additional information.

PILOTAGE

2-8 Pilots are generally available in most of the ports of Store Baelt. The principle pilot station is located at Slipshavn (sec. 2B-10); pilots from this station, upon prior arrangement, will meet vessels near Kattegat SW. Lightship (H. O. Pub. 41) or Spodsbjerg Havn (sec. 2C-6). Pilots from Slipshavn and Korsor (sec. 2B-9) conduct vessels through Store Baelt and through waters of the Kattegat and Baltic Sea. Pilots from Albuen (sec. 2C-8) conduct vessels throughout Smaalands farvandet and through Store Baelt as far as Nyborg-Korsor.

See also section 1-37.

Part A. NORTHERN PART OF STORE BAELT

2A-1 Rosnaes (western extremity, 55° 45' N., 10° 52' E.), a peninsula on the west coast of Sjaelland, extends westward between Sejero Bugt (see H. O. Pub. No. 41) and Kalundborg Fjord (sec. 2A-6). The peninsula rises to bare hills with heights up to about 200 feet, and it terminates westward in a narrow, cliffy point about 33 feet high; this point is the western extremity of Sjaelland and the northeastern entrance point of Store Baelt. Conspicuous objects on Rosnaes are described in section 2A-6.

Rosnaes Light is shown on the extremity of Rosnaes. A light is shown periodically and a fog signal is sounded at a fishing harbor on the north coast of Rosnaes in a position about 2 2/3 miles eastward of Rosnaes Light.

A reef extends 1/2 mile westward from the extremity of Rosnaes; a depth of 2.4 m (1.3 fm) exists near the offshore end and a rock awash lies about midway along the reef. Rosnaes Puller, on which are some

large rocks with depths of 2.2 to 4.7 m (1.2 to 2.5 fm), lies northwestward of the reef and from about 3/4 mile to 1 mile west-northwestward of Rosnaes. Between the reef and Rosnaes Puller, there is a narrow, buoyed channel with a least depth of 6.9 m (3.7 fm.). Several rocky patches with depths of less than 3 fathoms lie within 2/3 mile northeastward, northward, and northwestward, and northwestward of the extremity of Rosnaes. A 5-fathom patch lies about 1 1/3 miles west-northwestward of Rosnaes. Two wrecks with depths of 7 feet and 6 fathoms lie respectively about 3/4 mile west-northwestward and 1 mile westward of Rosnaes.

Rosnaes Puller Light is shown on the northwestern part of Rosnaes Puller and nearly 1 mile west-northwestward of Rosnaes. A fog signal is sounded and a radiobeacon transmits.

Submarine cables are laid in a west-northwesterly direction from a position on the northern side of Rosnaes close eastward of Rosnaes Light to the east coast of Samso (see H. O. Pub. No. 41); their direction is indicated by range beacons. The southernmost of these cables is laid between the extremity of Rosnaes, Rosnaes Puller Light and Samso.

FYNS HOVED is a small peninsula extending westward and northward from the northern end of Hindsholm (sec. 2A-2); its northern extremity, which is the southwestern entrance point of Store Baelt, lies about 12 miles southwestward of Rosnaes. Baesbanke, an 82-foot hill, rises on the western side of Fyns Hoved. Eastward of Fyns Hoved is a shallow cove nearly enclosed by a narrow strip of land; on the eastern side of the cove is a 26-foot hillock.

The coastal bank which borders the northern end of Hindsholm within the 6-fathom curve extends up to about 2 1/2 miles north-northeastward from Fyns Hoved and the narrow strip of land eastward. There are several stony patches on this part of the coastal bank.

LILLEGRUND, a reef with a least depth of 4 feet, lies on the northern part of the coastal

bank and with its northern extremity about $2\frac{1}{3}$ miles north-northeastward of Fyns Hoved; an obstruction with a depth of 5 feet is reported to lie close northwestward of the reef. A wreck with a depth of 3 feet lies on the reef. A wreck lies close eastward of the southern part of the reef. A 3-fathom patch lies about 1 mile northward of Lillegrund. A channel across the coastal bank immediately southward of Lillegrund has a least depth of $2\frac{3}{4}$ fathoms and is marked by a conical buoy and a can buoy moored respectively 2 miles and $1\frac{2}{3}$ miles northeastward of Fyns Hoved.

A lighted whistle buoy is moored nearly $1\frac{1}{2}$ mile north-northeastward of Lillegrund in a position about $2\frac{3}{4}$ miles north-northeastward of Fyns Hoved.

COAST—GENERAL

2A-2 The area comprised in this part of the chapter is the portion of Store Bælt between the northern entrance and the passages on either side of Sprogø. It includes Kalundborg Fjord, Jammerland Bugt, and Musholm Bugt on the eastern side, and Kerteminde Bugt on the western side. Also described are the detached dangers in the northern approaches to Store Bælt which lie southward of Samsø and a line joining the southeastern extremity of that island and Røsnæs.

Kalundborg Fjord lies between Røsnæs and Asnæs, a peninsula terminating westward about 5 miles south-southeastward of the extremity of Røsnæs; the port of Kalundborg is situated at the head of the fjord. Jammerland Bugt is entered between the western extremity of Asnæs and Reersø, a peninsula about $9\frac{3}{4}$ miles southeastward; it is seldom entered by large vessels as there are no harbors or loading places in the bay and extensive unmarked shoals lie off the entrance. Musholm Bugt lies between Reersø and Halsskov, a peninsula about $8\frac{1}{2}$ miles southward; it affords good anchorage. The island of Musholm and the small islet of Nordholm lie about 2 miles southward of the southwestern extremity of Reersø.

From the northern extremity of the narrow strip of land lying eastward of Fyns Hoved the western side of Store Bælt trends south-southeastward for about $9\frac{3}{4}$ miles to Stavreshoved. This stretch of coast is the eastern side of Hindsholm, a peninsula which extends northward on the northeastern side of Fyn and terminates in Fyns Hoved. There are no indentations of navigational importance between Fyns Hoved and Stavreshoved. Romsø, an island lying with its southwestern extremity about 2 miles north-northeastward of Stavreshoved, is separated from Hindsholm by Romsø Sund.

The coast of Fyn between Stavreshoved and Risinge Hoved, about $3\frac{3}{4}$ miles southward, recedes westward and forms Kerteminde Bugt. At the head of this bay is the town and harbor of Kerteminde.

From Risinge Hoved the western side of Store Bælt trends in a general south-southeasterly direction for nearly $8\frac{3}{4}$ miles to Knudshoved. The latter point is the southeastern extremity of Østerø, a peninsula projecting southeastward from Nyborg (sec. 2B-12).

Some parts of the coasts on both sides of Store Bælt are low and others are hilly; cliffs and bluffs rise from the shore in places. Hills near the coast have heights up to about 200 feet, the highest being on the northern and northeastern sides of Kalundborg Fjord. There are occasional wooded areas on both Sjælland and Fyn.

DEPTHS—DANGERS

2A-3 The depths in the fairway from the northern entrance of Store Bælt to Østerrenden and Vesterrenden are between 10 and 33 fathoms. Dybe Rende is described in section 2-2.

Dangers between Samsø and the northern entrance of Store Bælt.—Several dangers lie in the triangular area between Røsnæs, the southern side of Samsø, and Fyns Hoved; the depths throughout this area are very irregular.

A $5\frac{1}{4}$ -fathom patch lies about $3\frac{1}{2}$ miles westward of Røsnæs. Several patches with depths

of 3 3/4 to 5 fathoms lie from about 4 1/2 to 5 miles westward of Røsnæs.

FALSKE BOLSAKS, a rocky patch with a least depth of 2 fathoms, lies about 5 1/4 miles west-southwestward of Røsnæs. Its northeastern side is marked by a **LIGHTED BUOY**.

BOLSAKS, a rocky patch with a least depth of 4 feet, lies about 5 1/2 miles north-northeastward of Fyns Hoved. This patch, and several patches with depths of 3 to 3 1/2 fathoms, lie on a shoal which has depths of less than 6 fathoms and extends about 1 1/2 miles westward from a position about 6 1/4 miles northeastward of Fyns Hoved. The eastern side of the shoal is marked by a red conical **BUOY** and the western side is marked by a white can **BUOY**.

Several patches with depths of 4 to 5 1/4 fathoms lie from 3 3/4 miles north-northeastward to 5 1/4 miles northward of Fyns Hoved. A 5 1/2-fathom patch lies about 2 1/4 miles southward of the southeastern extremity of Samsø.

PALUDANS FLAK, with depths of less than 6 fathoms, extends about 2 1/3 miles south-southeastward from a position about 1 3/4 miles southward of the southwestern extremity of Samsø. On this shoal are several patches with depths of 2 1/4 to 3 fathoms. A **CAN BUOY** and a **LIGHTED BUOY** are moored on Paludans Flak near its northern edge. Several patches with depths of 3 1/2 to 5 3/4 fathoms lie between Paludans Flak and Fyns Hoved.

A **WRECK** with a depth of 3 3/4 fathoms lies nearly 3 1/2 miles northward of Fyns Hoved, and a **WRECK** with a depth of 7 fathoms lies about 3 1/4 miles north-northwestward of the same point.

OFFSHORE DANGERS IN THE NORTHERN PART OF STORE BÆLT.—A 6 1/4-fathom patch lies about 2 miles south-southwestward of the extremity of Røsnæs.

Several patches with depths of 4 1/4 to 6 fathoms lie from 3 1/4 to 4 3/4 miles west-southwestward of Asnæs Light (sec. 2A-6).

RYGGEN, a rocky patch with a least depth of 3 fathoms, lies nearly 5 miles eastward of the northern extremity of Fyns Hoved. A 3 3/4-fathom patch lies about 2 miles south-southwestward of Ryggen and 4 1/2 miles east-southeastward of the same point on Fyn.

LYSEGRUNDE lies on the eastern side of the fairway and off the entrance of Jammerland Bugt. It comprises three shoals with depths of less than 6 fathoms; the least depth over the northwestern and southeastern shoals is 2 3/4 fathoms, and that over the central shoal is 3 fathoms. These shoals are separated by channels having depths of 6 to 8 fathoms. The bottom on the shoals consist of sand, gravel, and stones. A **WRECK** with a depth of 3 3/4 fathoms is located on the central shoal in a position about 3 3/4 miles southward of Asnæs Light.

STUBBERUP KNOLD, a 3 3/4-fathom patch, lies about 4 miles north-northwestward of Romsø.

A wreck with a depth of 22.0 m (12.0 fm) lies about 4 miles northward of Romsø.

ROMSØ TUE, a 3 3/4-fathom patch, lies about 2 1/2 miles north-northeastward of Romsø. A red conical **BUOY** is moored nearly 1/4 mile eastward of this patch. Romsø Tue is especially dangerous because of its location near the usual route for deep-draft vessels.

POLYPHEM, a 3 1/4-fathom patch, and a 5-fathom patch lie respectively about 1 3/4 and 1 1/2 miles north-northwestward of the northern extremity of Romsø. A **WRECK** with a depth of 7 1/2 fathoms lies westward of Polyphem and about 2 1/4 miles north-northwestward of Romsø.

TORSKEPLADEN, a rocky patch with a depth of 3 1/2 fathoms, lies about 3/4 mile north-northeastward of the northern extremity of Romsø.

Several patches with depths of 5 1/4 to 6 fathoms lie within a distance of about 3 1/2 miles northwestward of Romsø.

The dangers fringing Romsø are described in section 2A-11.

ELEFANTGRUND is a shoal lying about 5 miles westward of Reersø and nearly midway

between that peninsula and Romsø. The least depth, 2 fathoms, is over one of several rocky patches which lie within the 6-fathom curve bounding the shoal. The western side of Elefantgrund is marked by a red BUOY. A deep channel separates this shoal from Lysegrunde; a WRECK with a depth of 7 1/2 fathoms lies on the northeastern side of this channel in a position about 4 1/2 west-northwestward of the southwestern extremity of Reersø.

Shoal patches with depths of 9.4 to 10.6 m (5.1 to 5.7 fm) lie 1 1/2 to 2 miles westward of the southern part of Reersø.

A WRECK with a depth of 6 1/2 fathoms lies nearly 4 miles eastward of Romsø. Two WRECKS with depths of 9 3/4 and 7 1/2 fathoms lie respectively about 5 miles eastward and 4 miles southeastward of Risinge Hoved. A WRECK with a depth of 3 3/4 fathoms lies nearly 2 miles northward of Knudshoved.

Dangers fringing the coast and lying in the coastal indentations are described with the related features.

ANCHORAGE.—An anchorage area about 2 miles long and 1 3/4 miles wide lies with its center about 2 miles west-southwestward of Røsnæs.

CURRENTS

2A-4 See section 2-5.

2A-5 See section 2-7.

KALUNDBORG FJORD

2A-6 The entrance of Kalundborg Fjord, the northernmost indentation on the eastern side of Store Bælt, lies between the extremities of Røsnæs and Asnæs, nearly 5 miles south-southeastward. The fjord extends about 7 1/2 miles east-southeastward from its entrance and gradually narrows. The fairway through the fjord is clear of dangers and is fairly deep.

The northern side of the fjord is formed by the southern coast of Røsnæs between the western extremity of that peninsula and a position nearly 4 1/2 miles east-southeastward. From the latter position the northeastern side of the fjord extends about 4 1/3

miles to the extremity of Gisseløre, a low tongue of land projecting south-southeastward from the coast. The town and port of Kalundborg are situated on the northern side of the small bay between Gisseløre and the shore of the head of the fjord, about 3/4 mile east-southeastward.

From the northwestern extremity of Asnæs the southern side of the fjord trends in a general easterly direction to a position about 3/4 mile southeastward of Gisseløre, and thence the shore curves northward to Kalundborg. Asnæsværkets Havn is located on the southern shore of the fjord, about 1 mile southeastward of Gisseløre.

NAVIGATIONAL AIDS.—Røsnæs Light, Røsnæs Puller Light, and the other navigational aids on the northern side of the entrance of Kalundborg Fjord are described in section 2A-1.

Asnæs Light (55° 40' N., 10° 56' E.) is shown on the northwestern extremity of Asnæs.

Gisseløre Light is shown on the extremity of Gisseløre except when ice conditions make the fjord inaccessible. A fog signal is occasionally sounded. A red and white vertically striped disused light tower stands close to the light structure now in use. A spar buoy, marking the edge of the coastal bank, is located about 100 yards southward of the light structure.

Kalundborg Fjord Light is shown on the western side of the pier at Asnæsværkets Havn. Other navigational aids at the head of the fjord are described with the ports of Kalundborg and Asnæsværkets Havn in section 2A-8.

Two dumping grounds are located on the shorebank on the northeastern side of the fjord.

ASPECT AND LANDMARKS.—The land on the northern and northeastern sides of Kalundborg Fjord is hilly and without woods. Prominent objects on these sides of the fjord are the light structure on the extremity of Røsnæs; Røsnæs (Ulstrup) Church, which is white with a red roof and is located about 3 miles east-southeastward of Røsnæs Light; a windmill close northwestward of Røsnæs Church, Raklev Church, about 4 miles southeastward of Røsnæs Church, is a white structure visible from a considerable distance northward of Røsnæs and southward of Asnæs; the coast Hospital; comprising several large gray buildings near the shore about

1 mile westward of Raklev Church; a radio mast about 475 feet high standing near Gisseløre Light and two other radio masts standing on the northern part of Gisseløre; the disused light tower on Gisseløre; and the town of Kalundborg, in which is a conspicuous cathedral with five high, pointed towers.

The land on the southern side of the fjord is lower than that on the northern and northeastern sides and it is partly wooded. Conspicuous objects are Mineslund Farm, located near the middle of Asnaes between two wooded areas, and the manor house and wooded park of Lerchenborg, about $3/4$ mile eastward of Hedvigslust Farm.

Inland from the head of the fjord is Eskildsbjerg, a 141-foot hill surmounted by a tower and located about 2 miles eastward of the conspicuous church in Kalundborg; the summits of two other hills of approximately the same height rise respectively about $1/2$ mile and $3/4$ mile east-southeastward of Eskildsbjerg. Tømmerup Church, which is white, stands about $2/3$ mile southeastward of the tower of Eskildsbjerg. The village churches of Aarby and Rørby are located respectively about $1\ 3/4$ miles south-southwestward and 2 miles southward of Tømmerup Church.

2A-7 DEPTHS—DANGERS.—From a position about $2/3$ mile southward of Røsnæs Light the 6-fathom curve follows the general trend of the northern and northeastern sides of Kalundborg Fjord at a distance of about 200 yards to $1/2$ mile offshore. About 1 mile from the head of the fjord the curve turns westward and skirts the coastal bank along the southern side of the fjord at a distance offshore of not more than about $1/3$ mile; near the outer end of Asnaes it turns north-northwestward and rounds Asnaes Nordvest Flak, which is described below.

Outside the 6-fathom curve the fjord has fairly regular depths of 6 to $9\ 1/4$ fathoms and is free from dangers, but from Gisseløre to the head of the fjord the depth decreases rapidly.

The dangers adjacent to the extremity of Røsnæs are described in section 2A-1.

ASNAES REV extends about 2 miles west-southwestward from the western extremity of Asnaes. It consists of a number of rocky patches and has a least depth of 7 feet. The outermost patch, which has a depth of 3 fathoms, is marked on its western side by a can BUOY; this patch is separated from the remainder of the reef by a narrow channel with a depth of more than 5 fathoms. Between the outer end of Asnaes Rev and the patches (sec. 2A-3) lying $3\ 1/4$ to $4\ 3/4$ miles west-southwestward of Asnaes Light there is a channel with depths up to 18 fathoms.

ASNAES NORDVEST FLAK, with depths of less than 3 fathoms, extends about 1 mile north-northwestward from the northwestward extremity of Asnaes. This flat consists of clay and sand and has several rocky patches on it. A buoy marks the northern side of the shoal area. The 6-fathom curve outside the flat is about $1\ 1/2$ miles northwestward and northward of the northwestern extremity of Asnaes. Several rocky patches lie between Asnaes Rev and Asnaes Nordvest Flak; the outermost of these patches has a depth of $3\ 1/2$ fathoms and lies about $1\ 1/2$ miles westward of Asnaes Light.

The coastal bank within the 3-fathom curve is narrow on the northern and northeastern sides of Kalundborg Fjord between the extremity of Røsnæs and the Coast Hospital. A drying rock lies about $3/4$ mile southeastward of Røsnæs Light and about 200 yards offshore; other rocks lie close inshore at various places along the coastal bank. Gisseløre Sand, the portion of the coastal bank between the Coast Hospital and the extremity of Gisseløre, extends up to about $1/2$ mile from the shore. The outer edge of Gisseløre Sand is marked by spar BUOYS.

The coastal bank is also narrow along the southern side of the fjord between the southeastern part of Asnaes and the shoal water at the head of the fjord. It is foul except in Havnevig, a slight indentation between positions about $3/4$ mile and 2 miles eastward of Asnaes Light. A rock with a depth of $2\ 3/4$ fathoms lies at the edge of the coastal

bank and nearly 1/2 mile southwestward of the extremity of Gisseløre.

A WRECK with a depth of 6 fathoms lies on the northeastern side of the fairway in a position about 3/4 mile west-southwestward of the Coast Hospital. A wreck with a depth of less than 2 feet lies about 1/2 mile west-northwestward of Gisseløre.

ANCHORAGES.—Vessels can anchor anywhere in Kalundborg Fjord. The bottom consists mainly of clay and mud and is good holding ground; inside Gisseløre there is weed. Westerly and northwesterly winds raise some sea in the fjord, but a vessel at anchor there should be able to ride out a gale without difficulty. Small vessels can find safe anchorage inside the extremity of Gisseløre; during strong winds a long scope of cable should be used because of the weedy bottom. Havne-mark Vig affords good anchorage during southerly winds.

DIRECTIONS.—A vessel which is approaching Kalundborg Fjord from northward and has passed westward of Røsnæs Puller should steer into the fjord, but only after the five-towered cathedral (sec. 2A-6) in Kalundborg bears about 111° and is well open southward of the south coast of Røsnæs. If bound for Kalundborg, the vessel should steer about 113° for Kalundborg Fjord Light (sec. 2A-6). From a position southward of Gisseløre the two pairs of range lights described in section 2A-8 lead into the harbor at Kalundborg.

A vessel approaching from southward can pass close outside Asnaes Rev and Asnaes Nordvest Flak in a least depth of 6 fathoms by steering for Røsnæs Church (sec. 2A-6) in range about 032° with the western gable of a thatched house near the shore. This range leads east-southeastward of the patches (sec. 2A-3) lying from 3 1/4 to 4 3/4 miles west-southwestward of Asnaes Light, and very close west-northwestward of the outermost patch of Asnaes Rev and the 3 1/2-fathom patch lying about 1 1/2 miles westward of Asnaes Light. After clearing Asnaes Nordvest Flak, the vessel, if bound for Kalundborg, should proceed toward the head of the fjord as directed above.

KALUNDBORG

Position: 55° 41' N., 11° 06' E.
Depths: Entrance channel, 12.0 m (39.3 ft.)
 Eastern basin, 6.0 to 8.0 m (19.6 to 26.2 ft.)
 Coaster basin, 5.0 m (16.4 ft.)
 Western basin, 1.9 to 6.0 m (6.2 to 19.6 ft.)
 Berths, 5.0 to 12.0 m (16.4 to 39.3 ft.)
Tidal range: 1 foot (mean).
Port plan: See "FACILITIES."

2A-8 The small deep-water port of Kalundborg is located on the northern side of the head of Kalundborg Fjord. It comprises two principal basins, a basin for coasters and other small vessels, and an outer berth for tankers. The port is well protected and is easy of access.

TIDES—WATER LEVEL.—The mean range of tide at Kalundborg is 1 foot.

Northwesterly gales may raise the water level as much as 4 feet and southeasterly gales may lower it as much as 3 feet.

ICE is seldom a serious hindrance to navigation in the approach to Kalundborg.

DEPTHS.—The entrance channel is dredged to a depth of 12.0 m (39.3 ft.). Berthing facilities southward of the channel have dredged depths of 9.0 to 11.0 m (29.5 to 36.0 ft.). The channel to the eastern basin is dredged to 9.0 m (29.5 ft.); depths in the eastern basin are 6.0 to 8.0 m (19.6 to 26.2 ft.). The approaches to the western basin have a depth of 7.0 m (22.9 ft.); depths in the western basin are 1.9 to 6.0 m (6.2 to 19.6 ft.).

HARBOR.—Kalundborg has an improved natural harbor protected on the west by Gisseløre. The port facilities are located on the northern, eastern and southern sides of the harbor, approached from the fairway of Kalundborg Fjord by dredged channels.

Asnaesværkets Havn consists of a wide mole extending northward from the southern side of the harbor. An oil pier extends into the deepwater entrance channel from a position about 1/2 mile eastward of the mole.

The eastern basin is L-shaped and is entered from westward. The southern side of this basin is formed by a wide mole, at the head of which is an offshore wharf for berthing tankers with cargoes of petroleum products. Within the basin, only the northern side of the outer part and the western side of the inner part are utilized as berthing space. There are two dolphins westward of the tanker berth and several in the basin.

The coaster basin, entered close westward of the entrance of the eastern basin, is quayed on its northern and eastern sides.

The western basin is protected on its western and southern sides by breakwaters. The main entrance is about 350 yards westward of the coaster basin, and an entrance for small craft is located about midway along the southern side of the western basin. The western side of a mole projecting south-southeastward on the northern side of the main entrance is used as a ferry berth. A quay extends westward from the ferry berth to a small craft basin in the northwestern corner of the western basin.

The dredged entrance channel leads north-northeastward from a position about $\frac{1}{4}$ mile southeastward of the extremity of Gisseløre. The least width of this channel is 130 feet. The dredged area extending from the inner end of the channel to the eastern basin and the tanker berth serves as a turning basin in which a vessel 525 feet long can swing with the assistance of tugs.

Navigational aids.—Kalundborg Fjord Inner Range Lights are shown at the head of the fjord. These lights in range 090° lead to Kalundborg Harbor Range.

Kalundborg Harbor Range Lights are shown on the northern side of the harbor and in range 020° lead through the entrance channel.

A light is shown on the northeastern side of the western basin main entrance. A fog signal

is sounded at this light when a mail steamer is expected.

Lights are shown on the ferry pierheads located at the northeastern side of the western basin.

The entrance channel is marked by buoys.

A red light is shown from a gray iron mast at the head of the southeastern oil jetty. The northwestern corner of the southern mole is marked by a light.

Regulations.—Vessels in the harbor area of Kalundborg are subject to the provisions of the regulations for navigation in Danish inner waters (sec. 1-39), except that a departing vessel must wait for an incoming vessel to clear the channel.

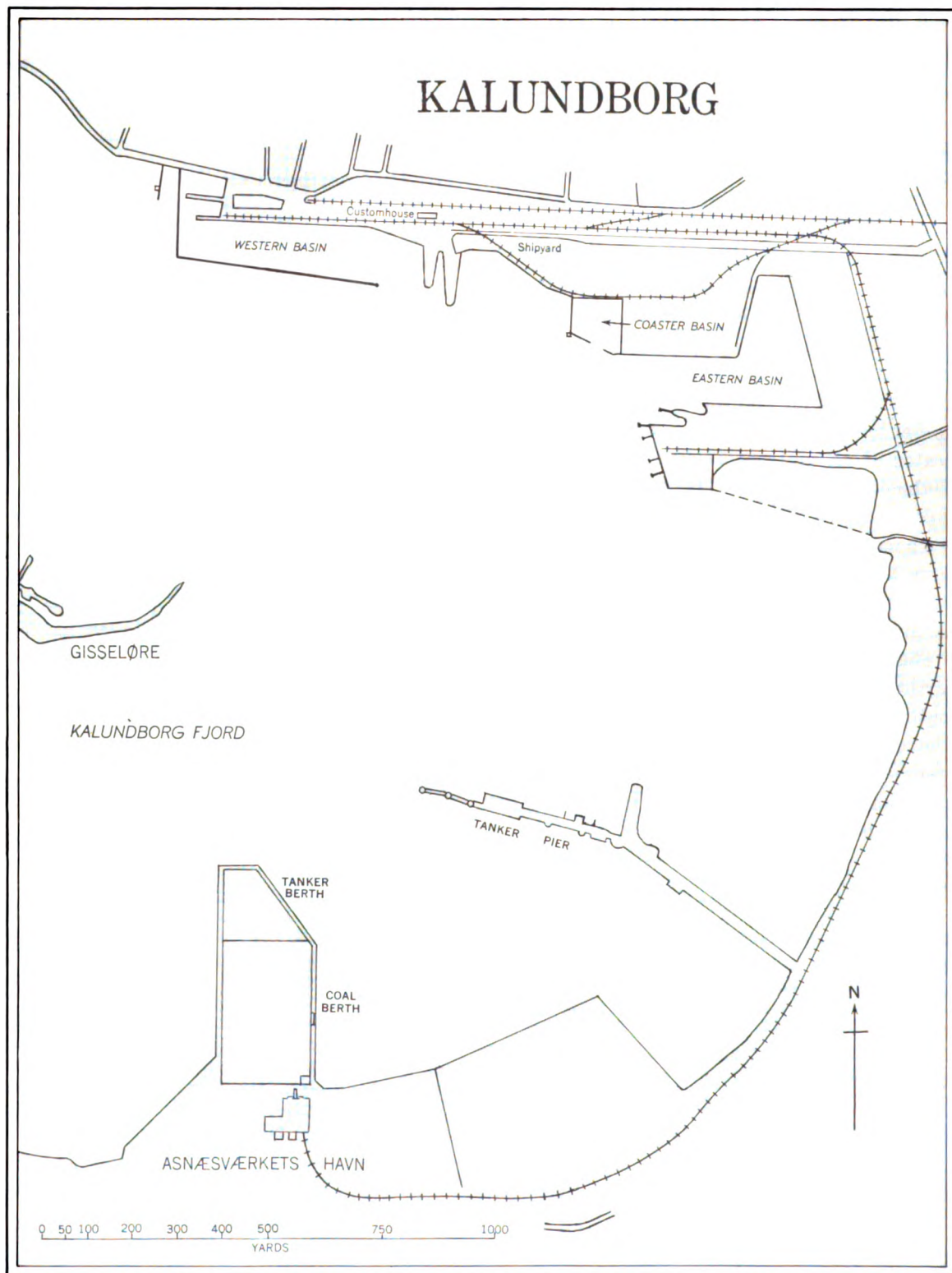
Vessels must not anchor in the dredged channel or lie at anchor outside the entrance of that channel in such a position as to hinder the entry or departure of other vessels.

The coaster basin may be closed while large vessels are discharging at the quay on the northern side of the outer part of the eastern basin. The eastern basin may be closed at night when tank vessels are discharging at the offshore wharf southward of the entrance to the basin.

Pilots from Kalundborg meet vessels a short distance westward of the extremity of Gisseløre. In addition to undertaking local piloting they will conduct vessels to Korsør, Nyborg, Fredericia, Skagen, and The Sound. See also section 1-37.

Directions.—See section 2A-7.

FACILITIES.—Kalundborg, a town with a population of about 11,600 (1966), is built on ground which is low near the shore of the fjord, but rises in terraced slopes to a height of 115 feet a short distance northward of the harbor. Among the industrial establishment of the town are a chemical fertilizer works, a plant manufacturing diesel engines, and a large oil refinery. There is a customhouse near the ferry berth.



The offshore wharf forming the tanker berth immediately southward of the eastern basin entrance has a face with a length of 320 feet and a depth of 9.0 m (29.5 ft.) alongside. The quay on the northern side of the outer part of the eastern basin is 750 feet long and has a depth of 8.0 m (26.2 ft.) alongside. The quay on the western side of the eastern basin is 570 feet long and has a depth of 7.0 m (22.9 ft.) alongside. The coaster basin has about 700 feet of quayage with a depth of 5.0 m (16.4 ft.) alongside. The ferry berth is 300 feet long and has a depth of 5.5 m (18.0 ft.) alongside. The quay on the northern side of the western basin is 1,400 feet long and has depths of 5.6 to 7.0 m (18.3 to 22.9 ft.) alongside.

A 2½-ton crane and a fixed conveyor are located on the western quay of the eastern basin, and a 6½-ton bridge transporter for unloading phosphate rock stands on the northern quay of the outer part of that basin. A 2-ton bridge transporter and a grain elevator are located on the northern quay of the western basin. Some of the quays are rail-served. Tugs are available.

Provisions are plentiful. Water is piped to the quays. Coal and petroleum can be obtained. Minor repairs can be made at a shipbuilding yard for small vessels which is located close eastward of the western basin; at this yard are a small marine railway and a machine shop. A salvage vessel is usually stationed in the port. Divers and welding equipment are available. There are railroad connections with København and other parts of Denmark. A ferry service for passengers and vehicles is maintained between Kalundborg and Aarhus. The town has a hospital.

Asnaesvaerkets Havn mole is about 1,500 feet long by 655 feet wide and has depths along the eastern side of 11.0 m (36.0 ft.). Coal and petroleum products are handled.

Dansk Esso's Oliepier is 2,800 feet long and has several berths with depths of 5.0 to 12.0 m (16.7 to 39.3 ft.) alongside.

JAMMERLAND BUGT

2A-9 Jammerland Bugt recedes nearly 4½ miles between Asnæs and Reersø. Urhøj, a 180-foot hill, is located near the coast on the eastern side of the bay. Reersø is joined to Sjælland by a low, narrow isthmus; the western side of the peninsula is cliffy and rises to a height of 62 feet. A church with a spire stands in a village on the eastern side of Reersø. A light is shown on the southwestern extremity of the peninsula. A fishing harbor on the eastern side of Reersø is described in section 2A-10.

Lysegrunde, which fronts Jammerland Bugt, is described in section 2A-3. Svallerup Banke, a sandy shoal on which are some rocks with a least depth of 7 feet, lies in the inner part of the bay and about 2½ miles northward of the

Reersø isthmus. Some above-water rocks lie about ¼ mile northwestward of the southwestern extremity of Reersø.

As the velocity of the northgoing and southgoing currents is greater in the fairway westward of Lysegrunde than in Jammerland Bugt, small vessels proceeding against the current may find it advantageous to keep inside the bay if their draft permits them to cross Lysegrunde. Vessels that are not capable of passing over the shoals rarely enter the bay.

MUSHOLM BUGT

2A-10 Musholm Bugt, on the eastern side of Store Bælt between Reersø and Halsskov (sec. 2A-2), is partly protected from westward by a flat, on which lie Musholm and Nordholm, and by Slettingsgrund, a shoal midway between Musholm and Halsskov. This bay has general depths of about 4 to 9 fathoms between the shoals in the entrance and the coastal bank. There is a fishing harbor on the eastern side of Reersø, and Mullerup Havn, available only for small vessels, is located on the eastern shore of Musholm Bugt about 3½ miles east-south-eastward of the southwestern extremity of Reersø.

Aspect and landmarks.—Reersø is described in sections 2A-2 and 2A-9. The coast bordering Musholm Bugt is generally unwooded except for Bildsø Skov, a grove situated close to the shore near the middle of the eastern side of the bay. A short distance north-northwestward and about 2 miles southward of Bildsø Skov are high bluffs; elsewhere the coast is low, but the land rises inland. Delby Banker are three conspicuous hills lying close together about 2 miles east-southeastward of the church on Reersø.

Other prominent landmarks on the eastern side of the bay are the buildings at Mullerup Havn; Stillinge Church, which is red and is located about 4 miles southeastward of Mullerup Havn; and two churches with spires in the town of Slagelse, about 4 miles east-southeastward of Stillinge Church. Slots Bjergby Church, painted white, stands at an elevation of 312 feet in a position nearly 2 miles south-southwestward of the churches in Slagelse; it

can be seen from much of the northern part of Store Bælt.

Højbjerg, a 95-foot pointed hill, rises on Halsskov in a position nearly 1 1/2 miles east-southeastward of Leje Odde (Lejodde), the northwestern extremity of the peninsula. Two BEACONS, which mark the direction of the northernmost of the submarine cables mentioned in section 2B-2, stand on Leje Odde; other cable beacons are located on the western side of Halsskov about 1 mile south-southwestward of Leje Odde.

ISLANDS AND DANGERS.— A flat with depths of less than 3 fathoms extends about 3 3/4 miles southward from Reersø. On the central part of this flat lies MUSHOLM, a small, low island with a yellow cliff about 30 feet high on its western side. Musholm Havn, on the eastern side of the island, is a good natural harbor for small vessels. Nordholm, a low islet, lies about 1/4 mile east-northeastward of Musholm. A 2 1/4-fathom rocky patch lies about 2/3 mile west-northwestward of Musholm, and a drying reef extends about 1/4 mile southward from a position close southeastward of the island.

SLETTINGSGRUND, which has a least depth of 2 1/4 fathoms, lies about 2 2/3 miles southward of Musholm. The fairway between this shoal and the flat extending southward from Reersø is about 1 mile wide and has a least depth of 4.7 m (2.5 fm.). A narrow channel, having depths of 21.0 to 27.0 m (11.4 to 14.7 fm.), extends from the fairway of Store Bælt into Musholm Bugt, passing close southward of Slettingsgrund and terminating southeastward of that shoal. On the southern side of the inner part of this deep channel the depths decrease rapidly to 4 1/2 fathoms in a position about 2 1/4 miles northward of the northwestern extremity of Halsskov, and thence southward they decrease gradually to the 3-fathom curve.

The coastal bank within the 3-fathom curve does not extend more than about 2/3 mile from the shores of the bay except in the

vicinity of a point about 4 1/2 miles southward of Mullerup Havn, where it extends up to 1 mile. Some 3-fathom patches outside the 3-fathom curve off this point lie within 1 1/3 miles of the coast.

ANCHORAGES.—Vessels can anchor anywhere in Musholm Bugt clear of the dangers, the holding ground being good throughout the bay. The northern part affords good anchorage in 4 to 5 fathoms with the wind from almost any direction. A considerable area in the southern part of the bay has depths of 6 to 8 3/4 fathoms.

Small vessels can anchor in about 2 3/4 fathoms in Musholm Havn, and in 1 to 3 fathoms in the outer part of the small bay eastward of Reersø. The holding ground is good in both these anchorages.

REERSØ FISHING HARBOR, on the eastern side of Reersø, is a small artificial basin formed by two moles. The entrance, which faces east-northeastward, and the harbor have a depth of 8 1/2 feet. The water level is raised up to 3 feet by northwesterly gales and lowered the same amount by southeasterly gales. A LIGHT is shown on the head of the southern mole. A fog signal is sounded at the light when vessels are expected.

MULLERUP HAVN is formed by two moles. A breakwater extends first northward and then southwestward from the northern mole, and the southern mole is prolonged by a breakwater extending in a west-northwesterly direction. Harbor depths are 1.5 to 4.0 m (4.9 to 13.1 ft.).

The water level may be raised about 3 feet by northwesterly gales and lowered about 2 feet by gales between southeast and south. The CURRENT sets across the harbor entrance. A LIGHT is shown on the head of the southern breakwater. Local PILOTS are available. Minor repairs to machinery can be made. The village of Mullerup is about 1 mile eastward of the harbor.

WESTERN SIDE OF STORE BÆLT— FYNS HOVED TO STAVRESHOVED

2A-11 The east coast of Hindsholm (sec. 2A-2) is hilly; the hills on the northern part are bare, but the southern part has scattered wooded areas. Bøgebjerg, a conspicuous 115-foot hill, rises on the coast about $4\frac{1}{2}$ miles north-northwestward of Stavreshoved (sec. 2A-2). Stubberup Church, which is white with a red roof, stands on high ground about 1 mile southwestward of Bøgebjerg. Stavreshoved is wooded and terminates in a cliff about 33 feet high.

The 6-fathom curve is about $\frac{1}{4}$ to 1 mile off the eastern side of Hindsholm from the northern end of the peninsula to a position about 3 miles north-northwestward of Stavreshoved. Thence it trends irregularly eastward for about $2\frac{1}{2}$ miles and then rounds Romsø at a distance of about $\frac{1}{3}$ to 1 mile from that island; eastward of Stavreshoved it is about $1\frac{1}{2}$ miles offshore. Snave Røn, two rocky patches with depths of 5 and 11 feet, lie on the coastal bank in a position about 2 miles north-northwestward of Bøgebjerg and nearly $\frac{1}{2}$ mile offshore. Offshore dangers northward of Romsø and Romsø Sund are described in section 2A-3.

Romsø (sec. 2A-2) is low and wooded; on its eastern side is a cliff about 23 feet high. The southwestern extremity of the island is a low, narrow point, from which a reef extends about $\frac{3}{4}$ mile westward; Klæpen, the outer end of this reef, dries. A light buoy is moored close west-southwestward of Klæpen. When ice is expected, the light buoy is replaced by a can buoy.

Romsø Light ($55^{\circ}31' N.$, $10^{\circ}48' E.$) is shown on the eastern side of the island.

Dangers adjacent to Romsø.—Romsø Nordvest Flak, with depths of $2\frac{3}{4}$ to 3 fathoms, extends about $\frac{3}{4}$ mile north-northwestward from a position about $\frac{3}{4}$ mile west-northwestward of the southwestern extremity of

Romsø. The coastal bank bordering the northern side of Romsø is rocky and has irregular depths within a distance of about $\frac{1}{4}$ mile from the island. From the eastern and south-eastern sides the coastal bank extends up to 1 mile, has irregular depths, and is steep-to. On this part of the coastal bank are **Romsø Puller**, several rocky patches with depths of 1 to $2\frac{1}{2}$ fathoms; the outermost patch lies about $\frac{3}{4}$ mile southeastward of Romsø and is marked by a lighted whistle buoy. Ronnen is the outer part of the coastal bank, with depths of less than 3 fathoms, which extends about $1\frac{1}{2}$ miles south-southwestward from the southern side of Romsø. A $1\frac{1}{4}$ -fathom rocky patch lies on the western side of Ronnen and is marked on its southwestern side by a can buoy.

Romsø Sund, the passage between Romsø and Hindsholm, is available for vessels with local knowledge and a draft of not more than 16 feet. The channel through the sound is bordered on the eastern side by Romsø Nordvest Flak, Klæpen, and Rønnen, and on the western side by the coastal bank which extends about $\frac{1}{2}$ mile from Hindsholm. Two patches with depths of $1\frac{3}{4}$ and 2 fathoms lie on the edge of the coastal bank on the western side of the channel and in positions respectively about $1\frac{1}{2}$ miles northward and $1\frac{3}{4}$ miles north-northwestward of Stavreshoved.

A submarine cable is laid between the western side of Romsø and Hindsholm. Beacons mark the landing places.

KERTEMINDE BUGT

2A-12 Kerteminde Bugt is entered between Stavreshoved and Risinge Hoved, about $3\frac{3}{4}$ miles southward; it indents the coast of Fyn to a distance of about $2\frac{1}{2}$ miles. At the head of this bay is the town of Kerteminde, which, with its church and water tower, is very conspicuous from the fairway of Store Bælt. The church is red and has a square tower at its western end

and a small spire at its eastern end. On the northern side of the bay and about $1\frac{3}{4}$ miles westward of Stavreshoved is Hverringe Manor, which is surrounded by woods. The manor house of Lundsgaard, also in a wooded area, stands about $\frac{3}{4}$ mile southeastward of Kerteminde Church. A short distance east-southeastward of Lundsgaard a high cliff rises from the southwestern shore of the bay.

The greater part of the bay has fairly regular depths of 6 to $7\frac{1}{2}$ fathoms over a bottom of clay, ooze, and fine sand. **Møllegrund**, which has a least depth of 3 fathoms, lies about 1 mile south-southeastward of Stavreshoved. Between Møllegrund and Stavreshoved there are irregular depths of $4\frac{1}{4}$ to 7 fathoms. The coastal bank within the 3-fathom curve does not extend more than $\frac{1}{3}$ mile from the shores of the bay and is steep-to in some places.

The **tidal currents** in Kerteminde Bugt change direction regularly during calm weather. The southgoing current sets along the northern shore of the bay. The velocity of the tidal currents does not exceed 1 knot.

There is good **anchorage** in the inner part of the bay with winds from south through west and north to northeast; easterly winds raise a choppy sea. The holding ground is good, and vessels with good ground tackle can ride out a gale here. The best anchorage is on the range formed by the tower and small spire of Kerteminde Church.

Kerteminde.—The small port of Kerteminde has a harbor formed by the narrow passage connecting Kertinge (Kerteminde) Nor, a large tidal lake, with Kerteminde Bugt. The sides of the harbor are prolonged by two breakwaters which project east-northeastward into the bay. The entrance between the heads of the breakwaters is about 130 feet wide. A short approach channel across the coastal bank is subject to silting and must be dredged every two or three years. In 1960 the depth in the channel was about $14\frac{3}{4}$ feet. A warping buoy is moored on either side of the channel entrance.

The mean range of **tide** is about $1\frac{1}{2}$ feet. The water level may be raised as much as 2 feet by winds from northwest through north to northeast, and it may be lowered as much as 3 feet by southerly winds. The **tidal currents** setting in and out of Kertinge Nor may attain a rate of 3 knots. During strong winds a current with a rate of up to 5 knots may set through the harbor.

A turning area in the outer part of the harbor has a diameter of 230 feet and a least depth of $13\frac{1}{2}$ feet. On the northern side of the harbor are quays with a total length of about 1,400 feet and with depths of 13 to 15 feet alongside. These quays are served by a railroad track. Quays and piers for fishing craft are on the southern side. A railroad bridge and a road bridge cross the inner end of the harbor.

A **light** is shown on the head of the northern breakwater; this light is not shown when the harbor is closed by ice. A **fog signal** is sounded from the northern breakwater. A **beacon**, surmounted by a barrel, stands on the head of the southern breakwater. Two **range lights** are shown on the northern side of the harbor near the approach to the railroad bridge; these lights in range 252° lead through the harbor entrance. Unlighted buoys mark the northern and southern sides of the entrance channel about 300 yards eastward of the breakwater heads.

A local **pilot** is available.

Provisions, water, and a small quantity of coal can be obtained. Minor repairs can be made. There is railroad communication with Odense.

WESTERN SIDE OF STORE BÆLT— RISINGE HOVED TO KNUDSHOVED

2A-13 The coast between Risinge Hoved and Knudshoved, about $8\frac{3}{4}$ miles south-southeastward, has few prominent features. There are scattered wooded areas near the shore and inland. The village churches at Revninge and Flødstrup, about $2\frac{1}{4}$ miles westward and $2\frac{3}{4}$ miles southwestward, respectively, of Risinge Hoved, can be seen on some bearings over the

tree-tops. Skalkenbjerg, a bare hill 144 feet high, rises nearly 3 miles southward of Risinge Hoved and is conspicuous from Store Baelt. The tall, slender spire of Nyborg Church, about 2 1/2 miles west-northwestward of Knudshoved, is visible from a considerable distance. The peninsula of Osterø projects about 2 miles southeastward from the land lying between the harbor of Nyborg and the coast northeastward; this peninsula is low and has a wood on its outer part. Knudshoved, the southeastern extremity of Osterø, is cliffy.

The 6-fathom curve passes about 1/2 mile off Risinge Hoved, and between that point and Knudshoved is as much as 1 mile offshore in places; it is about 1/4 mile eastward of the latter point. The coastal bank within the 3-fathom curve does not extend more than 1/2 mile from this section of the coast. Several rocky patches with depths of 1 to 2 fathoms lie on the outer part of the coastal bank.

A wreck with a depth of 3 3/4 fathoms lies about 2 miles northward of Knudshoved.

An abnormal magnetic disturbance has been reported to exist about 1/2 mile off the coast midway between Risinge Hoved and Knudshoved.

Several beacons indicating the directions and landing places of submarine cables from Halsskov and Sprogø stand on the coast north-eastward and eastward of Nyborg. See also section 2B-2.

KNUDSHOVED LIGHT (55° 17' N., 10° 51' E.) is shown on Knudshoved.

Knudshoved Faergehavn, close northwestward of Knudshoved Light, is protected by two breakwaters which extend eastward from the coast. Two ferry berths are located in the inner part of the

harbor.

There is a depth of 22 1/4 feet in the channel entrance and 20 1/2 feet in the harbor and alongside the berths. Lights are shown on each side of the harbor entrance and a fog signal is sounded on the southern side of the entrance. Lighted range beacons, in line 258°, are located in the harbor and lead between the breakwaters and to the ferry berths.

DIRECTIONS FOR THE NORTHERN PART OF STORE BÆLT

2A-14 Directions for the northern approaches to Store Bælt are given in H. O. Pub. No. 41.

From a position about 1 3/4 miles westward of Rosnaes Puller Light a deep-draft vessel should steer a southerly course to pass about 2 miles eastward of Falske Bolsaks and between a 5 1/2-fathom patch lying about 4 1/2 miles west-southwestward of Asnaes Light and Ryggen. Thence the vessel should steer a south-southeasterly course to pass about midway between Romso Tøe and Elefantgrund. Directions for the approaches to Osterrenden and Vesterrenden from the fairway westward of Elefantgrund are given in section 2B-13.

In thick weather a deep-draft vessel should keep in Dybe Rende (sec. 2-2) by sounding until Elefantgrund has been passed, being careful to avoid Ryggen and Romso Tøe, which lie very close to the western side of the channel.

A vessel drawing not more than 14 feet can pass over all the dangers near the fairway except Elefantgrund. From a position westward of Rosnaes Puller Light a vessel of this

draft can steer for the buoy marking the western extremity of Asnaes Rev and with a head current can then cross Lysegrund or pass through the outer part of Jammerland Bugt. Vessels proceeding northward across the shoals in thick weather can clear Asnaes Rev by locating the deep channel southward of the reef by sounding and then following that channel.

At night, the lights on Rosnaes Puller, Rosnaes, Asnaes, Romso, Sprogo, and Knudshoved; and Halsskov Rev Lightship are good guides.

The radiobeacon at Rosnaes Puller Light can be utilized during thick weather by vessels in the northern part of Store Baelt.

When proceeding through the northern part of the fairway, special attention should be given to the current. The predominant north-going current sets toward the dangers on the western side of the channel, and between Rosnaes Puller and Asnaes Rev it sometimes sets almost directly across the fairway toward Falske Bolsaks and Bolsaks.

ANCHORAGES

2A-15 KALUNDBORG FJORD.—See section 2A-7.

MUSHOLM BUGT.—See section 2A-10.

KERTEMINDE BUGT.—See section 2A-12.

Part B. CENTRAL PART OF STORE BAELT

2B-1 THE SOUTHWESTERN EXTREMITY OF HALSSKOV (55° 21' N., 11° 06' E.), about 1 1/2 miles south-southwestward of Leje Odde, is a low point projecting south-southwestward; a short distance northward of this point are two yellow cliffs about 52 feet high.

HALSSKOV REV extends about 1 1/2 miles west-southwestward from the southwestern point of Halsskov. This reef consists of a ledge, with depths of less than 1 fathom, extending about 1/3 mile from the point, and several detached rocky patches, with a least depth of 1 1/2 fathoms, lying farther offshore. The outermost patch, which has a

depth of 3 1/4 fathoms, lies about 1 1/2 miles west-southwestward of Halsskov and just inside the 10-fathom curve on the eastern side of the fairway. The southern side of Halsskov Rev is marked by a buoy, equipped with a radar reflector, moored about 3/4 mile south-southwestward of the southwestern extremity of Halsskov.

HALSSKOV REV LIGHTSHIP is moored close southwestward of the outermost patch of Halsskov Rev and about 1 3/4 miles west-southwestward of the southwestern extremity of Halsskov. A fog signal is sounded. This lightship is withdrawn for a short period in midsummer and is replaced by a lighted whistle buoy. When the lightship is withdrawn because of ice conditions a spar buoy marks its station.

KNUDSHOVED, on the western side of Store Baelt and about 9 miles west-southwestward of Halsskov, is described in section 2A-13.

GENERAL REMARKS

2B-2 The portion of Store Baelt lying between Halsskov and Osterro is divided by Sprogo into two passages, Osterrenden and Vesterrenden. The channels through these passages have depths sufficient for large vessels, but they are considerably constricted by Halsskov Rev, the dangers lying around Sprogo, and those between that island and Vresen, a small island about 6 1/2 miles south-southwestward.

From the southern end of Osterrenden the main fairway of Store Baelt trends in a general southerly direction for about ten miles to the northern end of Langelands Baelt. On the eastern side of the fairway are the islands of Egholm, Agerso, and Omo. Agerso Sund, the northernmost entrance of Smaalands Farvandet from Store Baelt, lies between Egholm and Agerso on the west and the Sjaelland coast on the east. Omo Sund, between Agerso and Omo, is the principal passage used by deep-draft ves-

sels entering Smaalands Farvandet from Store Bælt. These passages are described in sections 7A-5 to 7A-8.

The main fairway is entered from the southern part of Vesterrenden through channels between the dangers lying south-southwestward of Sprogø. Vesterrenden also affords access to the passage between Langeland and Fyn, and to Nyborg Fjord, which extends northwestward between Østerø and the coast southwestward.

Large vessels usually pass through Østerrenden rather than Vesterrenden because of its greater depth and comparatively clear fairway, but southbound vessel frequently use Vesterrenden in order to obtain a pilot from the pilot station at Slipshavn (sec. 2B-10).

The ports of Korsør and Nyborg are situated respectively on the eastern and western sides of the central part of Store Bælt. The former port is entered about $1\frac{1}{2}$ miles east-southeastward of the southwestern extremity of Halsskov and the latter is situated at the head of Nyborg Fjord.

Several submarine cables are laid across Store Bælt between Halsskov and the Fyn coast eastward of Nyborg, passing northward of Sprogø. Other submarine cables are laid between Halsskov and Sprogø, and between Sprogø and Fyn. The directions and landing places of the cables are indicated by beacons on Halsskov, Sprogø, and Fyn.

DEPTHS

2B-3 The portion of Dybe Rende (sec. 2-2) which passes through Østerrenden has depths as great as 39 fathoms. The least distance between the 10-fathom curves on either side of this deep channel is about $\frac{1}{2}$ mile, but depths of less than 6 fathoms are found close outside the channel.

In the northern part of Vesterrenden there are depths of 11 to $14\frac{3}{4}$ fathoms between the 10-fathom curves off Sprogø and Fyn. Westward of Sprogø these curves are separated by a distance of about $2\frac{1}{2}$ miles, but thence southward they converge, and off Knudshoved they

are less than $\frac{1}{4}$ mile apart in places. Between Knudshoved and the dangers southwestward and south-southwestward of Sprogø there is a fairway with depths of more than 6 fathoms and a least width of about $1\frac{1}{4}$ miles. The principal navigable channels leading from the southern part of Vesterrenden to the main fairway of Store Bælt have depths of $4\frac{3}{4}$ to 7 fathoms.

Within a distance of about 5 miles southward of Østerrenden and the same distance eastward and southeastward of the southern end of Vesterrenden there are depths of more than 6 fathoms in the main fairway. Westward of Agersø the fairway is narrowed to a width of about $\frac{3}{4}$ mile by shoals and rocky patches, but it becomes wider again between this constricted portion and the entrance of Langelands Bælt. Dybe Rende, with depths up to about 27 fathoms, continues from Østerrenden to Langelands Bælt, passing through the narrow fairway westward of Agersø.

The depths in the approach to Korsør and in Nyborg Fjord are given in sections 2B-8, 2B-10, and 2B-11.

ISLANDS AND DANGERS

2B-4 The dangers on the eastern side of Østerrenden consist mainly of the outer patches of Halsskov Rev (sec. 2B-1). Southward of Halsskov Rev are two patches with depths of $5\frac{1}{2}$ and $5\frac{1}{4}$ fathoms located about 2 and $1\frac{2}{3}$ miles, respectively, southwestward of the southwestern point of Halsskov.

Sprogø lies in the middle of Store Bælt between Halsskov and Østerø. An 82-foot hill on which is a lighthouse rises on the eastern part of the island. Several buildings stand on lower ground immediately westward of this hill; landing piers for small craft are located northward and southward of the buildings. A small white house stands on the western end of the island. On the south coast are beacons indicating the directions of the submarine cables (sec. 2B-2) laid between Sprogø and the east-

ern and western sides of Store Baelt. Sprogo Light is shown on the summit of the hill on the eastern part of the island.

The 6-fathom curve around Sprogo lies about 1/2 to 1 mile northward, 1 3/4 miles northeastward and southeastward, 1 1/2 to 2 miles southward, and 3/4 mile westward of the island. The depths within the 6-fathom curve are very irregular, especially southward of the island, where there are numerous rocky patches interspersed with deep channels.

SPROGO NORDOST PULLE, a rocky patch with a least depth of 3 1/2 fathoms, lies about 2 miles northeastward of Sprogo; its northeastern side is marked by a conical buoy.

SPROGO OSTERREY extends about 1 1/2 miles east-northeastward from the eastern extremity of the island. It is a narrow under-water spit of clay and rock and has depths of 1 to 3 feet over its outer end, which is steep-to. A conical buoy is moored nearly 1/2 mile northeastward of the spit and about 2 miles east-northeastward of Sprogo Light. About midway between the position of this buoy and the spit is a 5/4-fathom patch.

SPROGO VESTERREY extends about 3/4 mile west-southwestward from the western point of Sprogo. There is a depth of 2 fathoms on its outer end, which is marked by a conical buoy.

GÆLLEGRUND lies from about 3/4 mile to 1 1/2 miles southward of Sprogo. On it are several rocky patches with depths of 1 1/2 to 3 1/4 fathoms. Between Gællegrund and Dybe Rende are some rocky patches with depths of 3 1/4 to 5 1/4 fathoms; the easternmost, a 5 1/4-fathom patch, lies about 1 2/3 miles east-southeastward of Sprogo.

SPROGO PULLER, a number of patches consisting of clay and rock and having a least depth of 2 3/4 fathoms, lie southwestward and westward of Gællegrund. The southernmost and westernmost of these patches are about 2 miles southward and 2 1/4 miles southwestward of the western extremity of Sprogo; they have depths of 3 and 4 1/2 fathoms, respectively. Among the patches constituting Sprogo Puller there are channels with depths of 5 to 12 fathoms, but they are of no navigational importance.

Between Sprogo Puller and Vresen Puller (sec. 2D-3), located about 4 1/4 miles south-southwestward of Sprogo, the depths are very irregular and there are several rocky patches surrounded by deep water. The most dangerous of these patches are Vestlige Puller, Ostlige Puller, and Dronning Maries Puller.

VESTLIGE PULLER, two small patches with depths of 3 1/2 and 4 1/4 fathoms, lie respectively about 1 1/2 and 1 3/4 miles eastward of Knudshoved. A 5 1/4-fathom patch lies about 1/2 mile northward of the eastern patch of Vestlige Puller and 2 miles westward of Knudshoved, and a 5 1/2-fathom patch lies nearly 1/4 mile southward of the western patch.

OSTLIGE PULLER is a group of patches lying from 2 1/2 to 3 miles east-southeastward of Knudshoved and having a least depth of 3 1/4 fathoms. A 5 1/2-fathom patch lies about 1/2 mile westward of Ostlige Puller and nearly 2 1/4 miles east-southeastward of Knudshoved.

The channel between Sprogo Puller on the north and Vestlige Puller and Ostlige Puller on the south is the widest and deepest of the passages between the dangers south-southwestward of Sprogo. It is the principal channel for deep-draft vessels proceeding from Vesterrenden to the main fairway southward of Osterrenden. Except for the 5 1/4-fathom patch lying about 1/2 mile northward of the eastern patch of Vestlige Puller the depths in this channel are from 7 to 16 1/4 fathoms. A light buoy is moored in the eastern approach to the channel about 3 miles southward of Sprogo Light.

DRONNING MARIES PULLER, several patches with a least depth of 3 fathoms, lie from about 2 1/2 to 3 miles southwestward of Knudshoved.

The dangers and channels southward of Dronning Maries Puller are described in section 2D-3.

The dangers in the approach to Korsør are described in section 2B-8.

2B-5 Egholm, about $6\frac{1}{3}$ miles south-southeastward of the southwestern extremity of Halskov, is a small, low, partly wooded island which has no prominent features.

Agersø, close southward of Egholm, is connected with the latter by a bar that dries at very low water. A causeway crosses the bar and joins the two islands. The northern and southern parts of Agersø are low and flat, but the central portion has a height of about 40 feet. A small grove on the northern part of the west coast is the only wooded area on the island. A low red church, with a small tower, and a mill stand in the village of Agersø, which is situated on the eastern side of the central part of the island. The church and the mill are almost entirely hidden from westward by buildings and trees. Agersø Havn, on the eastern side of the island, is described in section 7A-7.

Helleholm Light ($55^{\circ}11' N.$, $11^{\circ}13' E.$) is shown on Helleholm, the outer end of a low peninsula which forms the southern end of Agersø.

Agersø Light is shown on Næbbet, the southwestern extremity of Agersø. An auxiliary light is shown here. Agersø Light forms the common rear light of a pair of range lights leading through the southeastern part of Omø Sund; see section 7A-8.

The shorebank fringing the western sides of Egholm and Agersø within the 3-fathom curve extends up to $1\frac{1}{2}$ miles north-northwestward and $\frac{3}{4}$ mile westward from the former island and up to $1\frac{1}{2}$ miles westward from the latter. **Egholm Flak** is that portion of the shorebank lying northwestward and northward of Egholm; its northwestern extremity is marked by a conical buoy in a depth of $3\frac{3}{4}$ fathoms.

A shoal with a least depth of $3\frac{1}{2}$ fathoms lies about $2\frac{1}{2}$ miles northwestward of Egholm. Between this shoal and the shorebank extending from the Sjælland coast an arm of Dybe Rende runs eastward and southward into Agersø Sund.

Between the 3-fathom curve off the western sides of Egholm and Agersø and the 10-fathom curve on the eastern side of Dybe Rende the

depths are irregular: there are a number of patches with depths of 3 to 6 fathoms.

Agersø Flak, consisting of several shoals and patches separated by deep channels, lies from about $\frac{1}{2}$ mile to $2\frac{1}{4}$ miles westward of Næbbet. The shoalest patch, which has a depth of 2 fathoms, lies nearly $1\frac{1}{4}$ miles westward of Næbbet; there is a depth of $4\frac{1}{4}$ fathoms on the westernmost patch. A light buoy is moored about $2\frac{1}{2}$ miles westward of Næbbet to mark the western extremity of Agersø Flak; A buoy is moored close south-southwestward of the 2-fathom patch.

Omø, separated from Agersø by Omø Sund (sec. 7A-8), lies with its northeastern extremity about 1 mile west-southwestward of Helleholm. Skovbanke, a bare 79-foot hill that slopes steeply on its eastern side, rises on the northeastern part of the island. A village in which is a white church is situated in the middle of the island; a conspicuous chimney stands eastward of the church.

Omø Light is shown on Langelands Øre, the western extremity of Omø.

Omø Havn (Kirkehavn) is a boat harbor on the northwestern side of Omø. It is protected by two breakwaters and has depths of 7 to 8 feet. The harbor is approached from northward by a dredged channel which has a normal depth of 9 feet but is subject to silting. A light is shown on the head of the northern breakwater.

Omø Nordvest Flak extends up to $1\frac{1}{2}$ miles from the northwestern side of Omø; it has very irregular depths of less than 6 fathoms. On the northern side of this flat the depths increase rapidly to the deep channel which passes through Omø Sund. The bottom is fine sand, with rocks in a few places. A conical buoy marks the northern extremity of Omø Nordvest Flak and is moored in a depth of $4\frac{1}{2}$ fathoms about 1 mile north-northwestward of the northeastern end of Omø. A reef with depths of less than 3 fathoms extends about $\frac{1}{2}$ mile westward from Langelands Øre.

Several patches with depths of 6 fathoms or less lie between the western side of Omø Nord-

vest **Flak** and **Dybe Rende**. The outermost of these are a $5\frac{3}{4}$ -fathom patch lying about 2 miles westward of **Langelands Øre** and two patches with depths of 6 fathoms and 4 fathoms located respectively about 2 miles and $1\frac{3}{4}$ miles west-northwestward of the same point.

Omø Sydvest Flak extends up to about $\frac{2}{3}$ mile from the southwestern side of **Omø** to the 3-fathom curve; the bottom is sand and rock: The 6-fathom curve off this side of **Omø** is about $\frac{3}{4}$ mile westward of **Langelands Øre** and nearly $1\frac{1}{2}$ miles westward of the southern extremity of the island. A rock with a depth of $2\frac{3}{4}$ fathoms lies about $\frac{3}{4}$ mile southwestward of **Langelands Øre**.

Omø Tofte, which extends about $3\frac{1}{2}$ miles southward from **Omø**, and **Omø Staalgrunde**, which lie southward of **Omø Tofte**, are described in section 2C-7.

Broen, a bank on which are a number of shoals and rocky patches with depths of less than 6 fathoms, lies from about 2 to $6\frac{1}{2}$ miles northeastward of **Langeland**. The southwestern side of this bank is separated from the shore bank within the 6-fathom curve off the northern end of **Langeland** by a narrow, tortuous channel with depths of more than 12 fathoms. The bottom on the deeper parts of the bank is sand and stones.

A $5\frac{3}{4}$ -fathom patch and a 5-fathom patch, the latter rocky, lie at the northeastern extremity of **Broen** and about 3 miles westward of the northern end of **Agersø**. **Vengeancegrund**, with a least depth of $3\frac{1}{4}$ fathoms, is a group of rocky patches lying on the northeastern part of **Broen** and from 3 to 4 miles westward of the southwestern extremity of **Agersø**. A lighted whistle buoy is moored about $\frac{1}{2}$ mile southeastward of the shoalest part of **Vengeancegrund** and nearly 3 miles westward of the southwestern extremity of **Agersø**. **Dybe Rende** passes between **Vengeancegrund** and **Agersø Flak**. A $4\frac{1}{4}$ -fathom patch lies about $\frac{2}{3}$ mile westward of **Vengeancegrund** and 4 miles northeastward of **Langeland**; the pas-

sage between this patch and **Vengeancegrund** has a least depth of 8.6 m (4.7 fm). A 5.9 m (3.2 fm) rocky patch about $2\frac{1}{2}$ miles north-eastward of the northern extremity of **Langeland** is the shoalest of several patches lying between the 7.5 m (4.1 fm) patch westward of **Vengeancegrund** and the southwestern side of **Broen**.

Wrecks.—Two wrecks, each with a depth of 7 fathoms, are located about 1 mile and $1\frac{1}{3}$ miles southeastward of **Knudshoved**. A wreck with a depth of $7\frac{1}{2}$ fathoms lies about 4 miles south-southeastward of **Sprogø**.

CURRENTS

2B-6 The currents in **Østerrenden** are usually strong. The northgoing current sets out from **Halsskov Rev**; the southgoing current sets toward the reef and is deflected southwestward.

The currents may also set strongly through **Vesterrenden**. In the northern part of the passage they have general northwesterly and southeasterly directions, but in the southern part their directions are very variable because of the irregular bottom, which may cause deflections of as much as 45° from the general directions.

See also section 2-5.

ICE

2B-7 See section 2-7.

APPROACH TO KORSØR

2B-8 Aspect and landmarks.—**Højbjerg**, which is visible from both northward and southward, is described in section 2A-10. Two cliffs, **Rebbesklint** and **Lygtebanken**, rise on the coast about 1 mile and $1\frac{1}{4}$ miles, respectively, east-southeastward of the southwestern extremity of **Halsskov**. From **Lygtebanken** to **Badstue Pynt**, about $\frac{3}{4}$ mile south-southeastward, the shore fronts the northern and southern parts of the town of **Korsør**; between these parts is the

harbor. Badstue Pynt terminates in a cliff about 20 feet high.

Halsskov ferry harbor, in Revkrog, protected by breakwaters, is located about $\frac{1}{2}$ mile east-southeastward of the southwestern extremity of Halsskov. The entrance between breakwaters is 390 feet wide, with depths decreasing from 8.0 m (26.2 ft.) in the entrance to 6.3 and 7.5 m (20.6 and 24.6 ft.) at the ferry berths. A berth for tankers, with a depth of 7.5 (24.6 ft.) alongside, is located on the northern side of the southern breakwater.

Several beacons marking the directions and landing places of the submarine cables to Sprogø (sec. 2B-2) stand on the southern side of Halsskov. Prominent structures in Korsør are the tower of Korsør Castle, on the southern side of the entrance of the main harbor; Korsør Church, which has a square red tower surmounted by a spire and is situated nearly $\frac{1}{4}$ mile southward of the castle tower; a water tower standing about $\frac{1}{4}$ mile eastward of the castle tower; and a very conspicuous observation tower located nearly 1 mile east-southeastward of Korsør Church.

DANGERS.—Depths of 7.9 and 7.4 m (4.3 and 4.0 fm) are charted in positions about $1\frac{1}{4}$ miles and 1 mile, respectively, southward of the southwestern point of Halsskov; the 6-fathom curve around Halsskov Rev passes close westward and southward of the former depth and close southeastward of the latter. A 7.2 m (3.9 fm) patch lies about 1 mile south-southwestward of the southwestern point of Halsskov, and two small shoals with least depths of 3 and $2\frac{3}{4}$ fathoms lie respectively about 1 mile southward and $\frac{3}{4}$ mile south-southeastward of the same point. The shorebank, with depths of less than 3 fathoms, extends up to $\frac{3}{4}$ mile from the coast in the vicinity of Rebbesklint and terminates westward in Kragepuller, two 2-fathom patches; Revkrog, an indentation in the shorebank between Halsskov Rev and Kragepuller, has depths of $3\frac{1}{4}$ to $4\frac{1}{2}$ fathoms. Lygtepuller, a reef with a depth of $11\frac{1}{4}$ fathoms, lies on the outer edge of the shorebank which extends about $\frac{1}{3}$ mile southwestward from Lygtebanken; a light buoy is moored in a depth of 3 fathoms on the southwestern side of this reef.

The outermost dangers on the southern side of the approach are Nygrund, which has a least depth of $2\frac{3}{4}$ fathoms and lies about $1\frac{1}{2}$ miles south-southwestward of the southwestern point of Halsskov, and a wreck which has the same depth and lies close westward of Nygrund. There are depths of less than 6 fathoms within about $\frac{1}{4}$ mile westward and northward of Nygrund, and between Nygrund and the harbor of Korsør the depths are mostly less than 6 fathoms and irregular. A wreck with a depth of $3\frac{1}{4}$ fathoms lies about 1 mile southwestward of Lygtebanken. Two patches with depths of 3 and $2\frac{3}{4}$ fathoms lie respectively about $\frac{2}{3}$ mile and $\frac{1}{4}$ mile west-southwestward of the harbor entrance.

Southward of the harbor entrance channel the shorebank inside the 3-fathom curve extends up to $\frac{3}{4}$ mile offshore. Badstue Rev, the southern part of this section of the shorebank, extends westward and west-southwestward from Badstue Pynt; it is rocky, especially near the point, where there are sunken rocks with a depth of only 1 foot and an above-water rock. The northwestern side of the shorebank southward of the entrance channel is marked by a conical buoy moored in a depth of 3 fathoms about $\frac{1}{4}$ mile southwestward of the harbor entrance. A conical buoy is moored in a depth of $4\frac{1}{2}$ fathoms close southward of the southwestern extremity of Badstue Rev and about $\frac{3}{4}$ mile west-southwestward of Badstue Pynt.

Navigational aids.—A light is shown in a position about $\frac{1}{2}$ mile south-southeastward of the southwestern extremity of Halsskov. A light buoy with a radar reflector and a white buoy with a radar reflector, are moored close west-northwestward and about $\frac{1}{2}$ mile southwestward, respectively, of this light. The light and the light buoy mark the approach to the ferry harbor in Revkrog. Several lights are shown and a fog signal is sounded at the ferry harbor.

Korsør Light is shown in a position about $\frac{1}{2}$ mile southwestward of Lygtebanken and about the same distance off the harbor entrance at Korsør. A fog signal is sounded.

Navigational aids in the harbor area of Korsor are described in the following section.

KORSOR

Position: 55° 20' N., 11° 08' E.
Depths: Entrance channel, 8.0 m (26.2 ft.).
 Outer harbor, 1.0 to 8.0 m (3.2 to 26.2 ft.).
 Main harbor, 6.0 to 8.0 m (19.6 to 26.2 ft.).
 Inner harbor, 1.0 to 6.5 m (3.2 to 21.3 ft.).
 Berths, 5.5 to 8.0 m (18.0 to 26.2 ft.).
Tidal range: About 1 foot.
Port plan: See "FACILITIES."

2B-9 The port of Korsor is situated at the entrance of Korsor Nor, a shallow tidallake. It is important chiefly as the eastern terminus of the train ferries and vehicular ferries which cross Store Bælt between Korsor and Nyborg, and link the main east-west rail line and highway extending across Denmark from København to Esbjerg. Most of the harbor is comprised in the winding passage connecting Korsor Nor with Store Bælt. In addition to slips for the ferries, there is quayage which can accommodate four medium-sized vessels and several coasters at berths suitable for working cargo.

TIDES AND WATER LEVEL.—The mean range of tide of Korsor is about 1 foot.

The water level may be raised about 3 feet by gales from northwest to northeast, and it may be lowered about 2 feet by southerly gales.

TIDAL CURRENTS.—The ingoing and outgoing currents alternate regularly during calm weather, but their direction varies in different parts of the harbor. At times the tidal currents are quite strong, and allowance should be made for them by vessels entering and moving in the harbor. Current signals for the ferries are displayed on the northern side of the harbor entrance.

ICE.—See table 4 in chapter 1 for ice information.

HARBOR.—The harbor of Korsor consists of four principal divisions: the outer harbor, the main harbor, the inner harbor, and the naval harbor. Two breakwaters protect the harbor from westward. The northern breakwater projects south-southwestward from the shore close east-southeastward of Lygtebanken; the southern breakwater extends northwestward from the head of a mole which forms the southern side of the outer harbor. An extensive area has been reclaimed southeastward of the southern breakwater. Flaadehavn, the naval harbor, seaward of the outer harbor, is protected by a breakwater extending westward and north-northwestward of the reclaimed area. The entrance between this breakwater and the southern breakwater protecting the outer harbor is 375 feet wide. Flaadehavn is divided by a jetty extending 500 feet north-northwestward from its head. There are depths up to 24 feet in the western part of Flaadehavn.

The outer harbor is entered between the heads of the breakwaters. On its northern side are three slips for train ferries; between the western slip and the northern breakwater lies a shallow bight that serves as an anchorage for small craft. Oil storage tanks stand on the mole on the southern side of the harbor. The northern side of the mole is quayed and is used mainly by oil barges. An offshore berth for tankers is situated in the western part of the outer harbor; it consists of several dolphins in line about 100 feet within the outer part of the southern breakwater. A pipeline trestle extends from the mole to the middle of the tanker berth. Two boat basins are located respectively in the southwestern and eastern parts of the outer harbor.

The dredged entrance channel has a depth of 26 feet and leads in an east-northeasterly direction between the breakwater heads, where it is about 340 feet wide. A continuation of the entrance channel is dredged to a depth of 26 feet through the outer harbor to the northern end of the main harbor, and a dredged area with the same depth extends from this channel to the tanker berth near the southern breakwater. The southwestern part of the outer harbor is dredged to a depth of 18 feet.

The main harbor trends in a general south-southeasterly direction from the northeastern part of the outer harbor for about 1/3 mile to a bascule bridge that separates the main harbor from the inner harbor. This section of the harbor is almost completely lined by quays which are devoted mainly to the handling of bulk cargos.

A prolongation of the 8.0 m (26.2 ft.) dredged channel that leads through the outer harbor passes a short distance southward of the quay across the northern end of the main harbor; there are depths of 6.5 to 7.0 m (21.3 to 22.9 ft.) between the channel and the quay. The remainder of the main harbor has a depth of 8.0 m (26.2 ft.) in its eastern and southern parts, and depths of 6.0 to 8.0 m (19.6 to 26.2 ft.) in an area bordering its western side. The navigable passage through the bascule bridge has a depth of 8.0 m (26.2 ft.) over a width of 65 feet. The bridge is opened at fixed times on application to the harbor master.

The inner harbor, which lies immediately eastward of the bascule bridge, consists of the dredged eastern end of the passage connecting Korsor Nor with Store Bælt. Both the northern and southern sides are quayed, and the eastern limit of the dredged area is marked by several dolphins. The depths in the inner harbor are 1.0 to 6.5 m (3.2 to 21.3 ft.).

SUBMARINE CABLES are laid across the harbor on both sides of the bascule bridge.

NAVIGATIONAL AIDS.—Two range lights are shown eastward of the ferry slips; in range 074° they lead into the harbor.

A light is shown on the head of the northern breakwater. A fog signal is sounded when a ferry is expected.

A light is shown on the head of the southern breakwater.

A light is shown on the head of the breakwater enclosing Flaadehavn.

Two range lights for the dredged channel leading to the quay on the southern side of the outer harbor are shown on that quay. These lights in range bear 154°, but they are often obscured by vessels lying alongside the quay.

Various lights are shown at the ferry slips when ferries are arriving or leaving. A pair

of range lights is shown at the vehicular ferry berth when that ferry is entering the harbor.

Two pole beacons with circular topmarks stand eastward of the northern end of the main harbor. These beacons in range 077° indicate the southern side of the 8.0 m (26.2 ft.) dredged channel leading between the heads of the breakwaters.

REGULATIONS.—Outside the breakwaters and as far westward as the fairway limit, which is the meridian of 11° 06' 24" E., vessels are prohibited from anchoring within 220 yards of the alinement of the range lights leading through the harbor entrance, except in cases of urgent necessity.

Anchoring is prohibited near an underwater compressed air conductor which is laid between a position on the coast close westward of the root of the northern breakwater and Korsor Light.

Anchoring is prohibited inside the breakwaters.

Special regulations are in effect for vessels calling at Flaadehavn.

PILOTS are available. See also section 1-37.

DIRECTIONS.—A vessel bound for Korsor from northward and having passed through Osterrenden as directed in section 2B-13 should steer to bring the lights located eastward of the Korsor ferry slips in range 074° and proceed on the range toward the harbor. This range leads between the shoals on either side in a least depth of 20 1/2 feet, but it passes very close northward of the two patches of 3 and 2 3/4 fathoms lying about 2/3 and 1/2 mile west-southwestward of the harbor entrance. A vessel approaching on the alinement of the range lights and intending to enter through the 8.0 m (26.2 ft.) dredged channel should alter course slightly northward when about 1/2 mile westward of Korsor Light and keep just northward of the beacon range indicating the southern side of the channel.

A vessel approaching the entrance range from southward should take care to avoid Nygrund.

Light-draft vessels coming from southward can pass between Nygrund and Badstue Rev in a least depth of 3 fathoms by keeping the easternmost of three tall chimneys located about $\frac{1}{3}$ mile northeastward of Halsskov Light in range 039° with that light.

FACILITIES.—Korsør, a town with a population of 15,260 in 1966, is situated on both sides of the entrance of Korsør Nor. Besides the ferry service, which is the principle maritime activity of the port, there is trade comprising importation of coal, petroleum products, fodder, grain, fertilizer, cement, timber, and general cargo; exports are mainly agricultural products. Korsør is a first port of entry.

The offshore tanker berth in the outer harbor affords 600 feet of usable berthing space with a depth of 8.0 m (26.2 ft.). The quay on the southern side of the outer harbor has a usable berthing length of 800 feet with a depth of 18 feet alongside.

The quay fronting the northern end of the main harbor has a berthing length of 550 feet with depths of 6.5 to 7.0 m (21.3 to 22.9 ft.) alongside; the eastern end of this quay is used as a berth for vehicular ferries. A quay with a depth of 8.0 m (26.2 ft.) alongside extends 1,500 feet along the eastern side of the main harbor, and on the western and southwestern sides of this basin there is about 1,500 feet of quayside with depths of 6.0 to 8.0 m (19.6 to 26.2 ft.) alongside.

Two quays on the northern side of the inner harbor have berthing lengths of 450 and 540 feet, and a quay on the southern side has a berthing length of 860 feet. There are depths of 6.0 to 6.5 m (19.6 to 21.3 ft.) alongside these quays.

The cargo-handling facilities of the port include a 10-ton crane, several cranes with smaller capacities, and four grain elevators. The quays are served by rail.

Provisions are plentiful. Water is piped to the quays. Petroleum for small motor vessels and coal can be obtained. There is a machine shop and a foundry in the town. A marine railway with a lifting power of 450 tons is located at a small shipyard on the northern side of the inner harbor. A salvage vessel is stationed at the port. Divers are available.

There is railroad communication with all parts of Denmark and with other countries of Europe. Vehicular ferries are operated from Korsør to Nyborg and to Lohals (sec. 2D-7).

A hospital is situated in the southern part of Korsør.

NYBORG FJORD

2B-10 Nyborg Fjord extends in a northwesterly direction on the southwestern side of Østerø (sec. 2A-13) for a distance of about 2 miles to the harbor of Nyborg. It affords well-

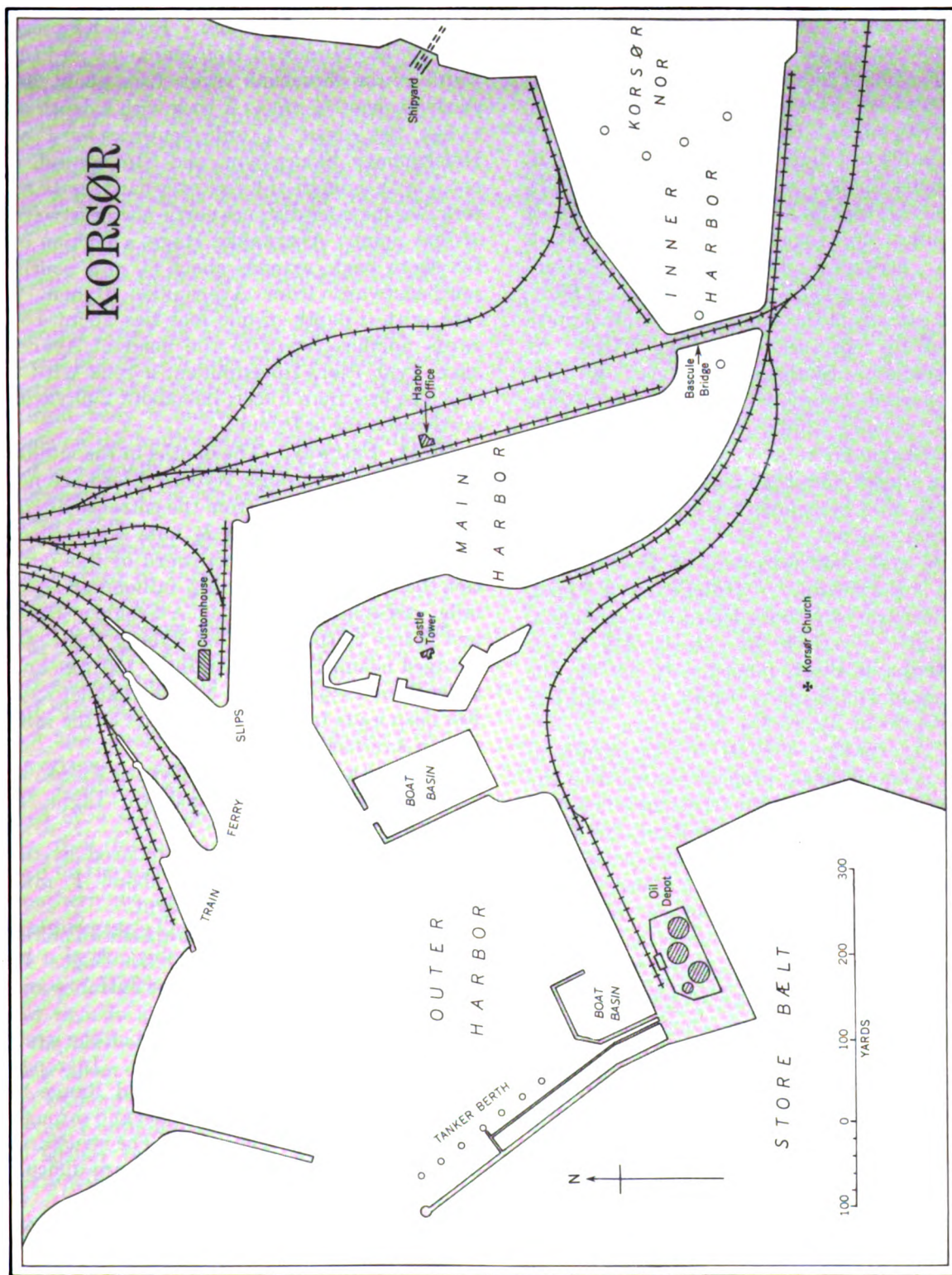
sheltered anchorage with all winds, but the fairway is considerably contracted by shoal flats extending from the shores of the fjord. Knudshoved, the southeastern extremity of Østerø, and its light and mole are described in section 2A-13.

The south coast of Østerø lies between Knudshoved and Slipshavn Pynt, about 1 mile west-southwestward. Knudshoved Flak, the shorebank fronting this side of the peninsula, extends up to $\frac{1}{2}$ mile offshore within the 3-fathom curve; two rocks with depths of 4 and 9 feet lie on the inner part of the bank about midway between Knudshoved and Slipshavn Pynt. The 6-fathom curve is about $\frac{2}{3}$ mile southward of Knudshoved, but is only about 200 yards off Slipshavn Pynt.

Northeastern side of Nyborg Fjord.—Slipshavn Pynt ($55^{\circ}17' N.$, $10^{\circ}50' E.$) is low and has on it several buildings, the remains of an old battery, and a light structure.

Slipshavn is located close north-northeastward of Slipshavn Pynt and on the southern side of the entrance of a cove which indents the southwestern side of Østerø. It comprises a short mole and some quays with depths of $9\frac{1}{4}$ to 13 feet alongside. Access to this harbor is normally restricted to Danish naval vessels and other government craft. Slipshavn is the main pilot station in Store Bælt; see also section 2-8.

Between Slipshavn and Nyborg the shorebank extends up to $\frac{2}{3}$ mile from the southwestern side of Østerø to the 3-fathom curve. The inshore half of the bank is a shallow flat on which lies Lindholm, a grass-covered islet. **Lindholm Grund**, on the outer part of the shorebank and south-southwestward of Lindholm, has depths of less than 6 feet over a bottom of rocks, clay, and sand; it is separated from Lindholm by a narrow channel in which are depths of less than 2 fathoms. Northwestward of Lindholm Grund the outer part of the shorebank has depths of $1\frac{3}{4}$ to 3 fathoms as far as Havgrund, a spit with depths of 1 to 5 feet, which projects southward from the eastern side of Nyborg harbor entrance. **Stenhøj**, a 5-foot rocky patch, lies about $\frac{1}{3}$ mile west-southwestward of Lindholm and close to the northeastern side of the fairway.



A wreck with a depth of 5 fathoms lies nearly $\frac{1}{2}$ mile westward of Slipshavn Pynt.

Western side of Nyborg Fjord.—The land on the western side of the fjord is relatively high and is partly wooded. Helvedbakke, about $2\frac{1}{2}$ miles southwestward of Slipshavn Pynt, is 194 feet high and has a wooded summit. Kogsbølle Bakke, a rather flat 213-foot hill with a large rock on its summit, is situated about $1\frac{1}{3}$ miles north-northwestward of Helvedbakke. Eastward of a line joining Helvedbakke and Kogsbølle Bakke is Kajbjerg Skov, which extends to the shore on the southwestern side of the entrance of Nyborg Fjord. At **Holckenhavn Skansepynt**, about $\frac{2}{3}$ mile north-northeastward of Kajbjerg Skov, some partly wooded bluffs rise from the shore. Holckenhavn Castle, a conspicuous building with a square tower and a spire, is situated about $\frac{2}{3}$ mile west-northwestward of Holckenhavn Skansepynt.

Close north-northeastward of Holckenhavn Castle is the entrance of **Holckenhavn Fjord**, a shallow arm of Nyborg Fjord that extends in a westerly direction for nearly $1\frac{1}{4}$ miles. **Holckenhavn Bugt**, immediately outside the entrance of Holckenhavn Fjord, is a small bay with depths of $3\frac{1}{4}$ to $3\frac{3}{4}$ fathoms in its outer part. **Avernakke**, a small, low peninsula on which is an oil depot, projects eastward on the northern side of Holckenhavn Bugt; its southeastern extremity, **Avernakke Pynt**, lies about $\frac{1}{2}$ mile east-southeastward of the northern entrance point of Holckenhavn Fjord. **Avernakke Pynt Pier**, which projects southward from the point, is described in section 2B-12.

Conspicuous objects in Nyborg are Nyborg Church, which is described in section 2A-13, and a water tower standing about $\frac{1}{3}$ mile west-northwestward of the church.

The shorebank within the 3-fathom curve off the northern end of Kajbjerg Skov extends about 1 mile from the shore and is very irregular. **Hvidegrund**, the outer portion of this protrusion of the shorebank, has a least depth of $1\frac{1}{2}$ fathoms on its northern part; the bottom is sand and weed. A rocky patch having a least

depth of 7 feet lies about midway between Hvidegrund and the shore. From Kajbjerg Skov to the entrance of Holckenhavn Fjord the width of the shorebank varies from about 200 yards to about $\frac{1}{3}$ mile. A rock with a depth of 4 feet lies about $\frac{1}{4}$ mile southeastward of Holckenhavn Skansepynt, and **Slotsgrund**, a patch with a depth of 6 feet over hard sand and rock, lies the same distance north-northeastward of that point. **Avernakke Hage**, a portion of the shore bank, extends about $\frac{1}{3}$ mile south-southeastward from Avernakke. **Dynen**, a rock with a depth of one foot lies about 150 yards northeastward of the head of Avernakke Pynt Pier. Hovedpuden, a rock with a depth of less than 6 feet, lies about 200 yards northeastward of Dynen.

2B-11 Fairway.—The depths in the middle of the fairway through Nyborg Fjord are not less than $5\frac{1}{2}$ fathoms from the entrance of the fjord to a position about $\frac{3}{4}$ mile eastward of Holckenhavn Castle. Northward of this position the depth decreases to $4\frac{1}{4}$ fathoms about $\frac{1}{4}$ mile east-southeastward of Avernakke Pynt, and thence to the harbor of Nyborg there is a dredged channel with a width of 130 feet and a depth of $24\frac{1}{2}$ feet. A branch channel $32\frac{1}{2}$ feet deep leads from the deeper part of the fairway to Avernakke Pynt Pier.

Currents are negligible in Nyborg Fjord.

Navigational aids.—Slipshavn Light is shown on Slipshavn Pynt.

A **lighted whistle buoy** is moored at the entrance of Nyborg Fjord about 1 mile southeastward of Slipshavn Light.

Nyborg Fjord Range Lights are shown on the northwestern side of Holckenhavn Bugt. In range 306° they lead through the entrance and outer part of the fjord.

Nyborg Range Lights are shown on the western side of the harbor at Nyborg. In range 328° they lead from Nyborg Fjord Range to the entrance of the dredged channel and through the outer part of that channel. The structures from which these lights are shown are difficult

to identify. Other harbor lights are described in section 2B-12.

A light is shown on the head of Avernakke Pynt Pier about $\frac{1}{4}$ mile southward of Avernakke Pynt.

Two lights for the guidance of ferries are located on structures standing on the shorebank which extends from the eastern side of Avernakke; a fog signal is sounded at the southeasterly light. These lights are shown and the fog signal is operated only when ferries are expected. The lights are exhibited by day when the visibility is poor.

A notice board on a white pole marks the outer end of a suction pipe which extends about 90 yards from the eastern side of Avernakke.

A light buoy is moored in a depth of $4\frac{1}{4}$ fathoms on the southwestern side of Lindholm Grund and nearly $\frac{2}{3}$ mile west-northwestward of Slipshavn. It is replaced by a spar buoy when ice forms.

The southwestern side of Lindholm Grund is also marked by three spar buoys which are moored in a depth of 2 fathoms. One of the buoys is located close east-southeastward of the light buoy, and the other two mark the southeastern end of Lindholm Grund and the western side of Stenhøjen.

Four spar buoys mark the southwestern side of Havgrund.

The northeastern side of Hvidegrund is marked by a spar buoy which is moored in a depth of 2 fathoms. Three spar buoys are moored on the eastern side of Avernakke Hage, the southern one marking Dynen.

Anchorage.—The best anchorage in Nyborg Fjord is in the wide part of the fairway off the entrance of Holckenhavn Fjord. A vessel can anchor here in a depth of about $5\frac{1}{4}$ fathoms with the northeastern extremity of Avernakke bearing about 328° , and Sprogø Light (sec. 2B-4) bearing about 070° and just open northward of Lindholm. This anchorage affords good shelter from all winds, although southeasterly winds may raise a little sea.

The most-used anchorages for small vessels are between Slipshavn and Lindholm Grund. in depths of 5.5 to 7.5 m (3.0 to 4.1 fm); on the shorebank southward of Havgrund, in a depth of about $2\frac{1}{2}$ fathoms; and in Holckenhavn Bugt, in depths of $3\frac{1}{2}$ to $3\frac{3}{4}$ fathoms, about 140 yards southwestward of the alignment of Nyborg Fjord Range Lights.

Anchorage is prohibited on or near the range lines, in the dredged channels, and in an area extending 330 yards southward and westward from Avernakke Pynt Pier.

Directions.—A vessel bound for Nyborg Fjord from northward, having arrived at a position about 1 mile eastward of Knudshoved, should steer a southwesterly course, keeping not less than $\frac{3}{4}$ mile off the south coast of Østerø in order to be well clear of Knudshoved Flak. When this course intersects Nyborg Fjord Range, the vessel should enter the fjord on that range (306°), which leads about 300 yards southwestward of Slipshavn Pynt. Nyborg Fjord Range intersects Nyborg Range about 200 yards southward of the light buoy on the southwestern side of Lindholm Grund, and at this intersection the vessel, if proceeding to the harbor at Nyborg, should alter course to the latter range (328°), which leads southwestward of Stenhøjen and into the dredged channel between Avernakke Hage and Havgrund. When Nyborg Church is nearly in range with the customhouse, a large yellow building on the northern side of Østerhavn (sec. 2B-12), the vessel should alter course northward and steer for the harbor entrance.

NYBORG

Position:	55°19'N., 10°48'E.
Depths:	Approach channel, 7.5 m (24.6 ft.). Vesterhavn, 4.4 to 7.5 m (14.4 to 24.6 ft.). Østerhavn, 4.0 to 5.5 m (13.1 to 18.0 ft.). Small craft basin, 2.5 to 3.5 m (8.2 to 11.4 ft.).
Tidal range:	About 1 foot.
Port Plan:	See "FACILITIES."

2B-12 The port of Nyborg, situated at the head of Nyborg Fjord, is the western terminus of the train and vehicular ferry service (sec. 2B-9) between this port and Korsor. In addition to its ferry terminal facilities, the port includes an important receiving and distribution depot for petroleum products, two quayed basins available for cargo handling, and a basin for fishing craft and yachts.

TIDES AND WATER LEVEL.—The mean range of tide is about 1 foot.

Westerly and northwesterly gales may raise the water level as much as 3 feet, and southeasterly and southerly gales may lower it about 2 feet.

ICE.—See table 4 in chapter 1 for ice information.

HARBOR.—The harbor of Nyborg comprises the head of Nyborg Fjord northward of a line extending eastward across the fjord from the southeastern part of Avernakke. Outside the harbor limit, but regarded as facilities of the port, are Avernakke Pynt Pier and the adjacent petroleum depot, Slipshavn, and Knudshoved Mole.

Avernakke Pynt Pier extends about 1,350 feet southward from Avernakke Pynt; it is for the exclusive use of petroleum tankers. A concrete mole about 215 feet long and 35 feet wide forms the outer part of the pier and is the only part that affords berthing space. There is a depth of 10.0 m (32.8 ft.) at its head and in the approach channel. There are depths of 5.3 m (17.3 ft.) on the eastern side and 6.0 m (19.6 ft.) close off the western side of the mole. The remainder of the pier consists of a causeway projecting from Avernakke and a wooden pipeline trestle connecting the causeway with the mole. A dolphin located about 165 feet southeastward of the head of the pier is used to facilitate berthing.

The ferry terminal is situated on the eastern side of the harbor. There are four slips for train ferries and a basin for idle ferries and small craft. The ferry basin is separated from Vesterhavn, the largest of the harbor basins, by a mole projecting southward.

Vesterhavn is entered from the 7.5 m (24.6 ft.) dredged approach channel and extends about 1,200 feet northward. A berth for a vehicular ferry is located at the

northeastern corner of this basin. There are depths of 7.0 to 7.5 m (22.9 to 24.6 ft.) in the western part of Vesterhavn, 5.0 to 6.8 m (16.4 to 22.3 ft.) in the eastern part and 4.4 to 5.5 m (14.4 to 18.0 ft.) at the northern end.

Osterhavn, entered from Vesterhavn, lies eastward of the northern part of the latter basin, from which it is separated by a mole. The depth in Osterhavn is 18 feet except near the northern side, where it is 13 feet.

Westward of Vesterhaven, and separated from it by a broad mole, is a basin for fishing vessels and yachts. It is protected by two breakwaters and has depths of 8 to 11 1/2 feet.

The sides of all the basins are quayed.

A submarine cable is laid from the ferry terminal to the two light structures on the shorebank extending from the eastern side of Avernakke.

NAVIGATIONAL AIDS.—Nyborg Range Lights are described in the preceding section.

A light is shown on the southeastern extremity of the broad mole between Vesterhavn and the small craft basin.

A light is shown on the head of the mole that separates the ferry basin from Vesterhavn.

A light is shown on the head of the mole between Vesterhavn and Osterhavn.

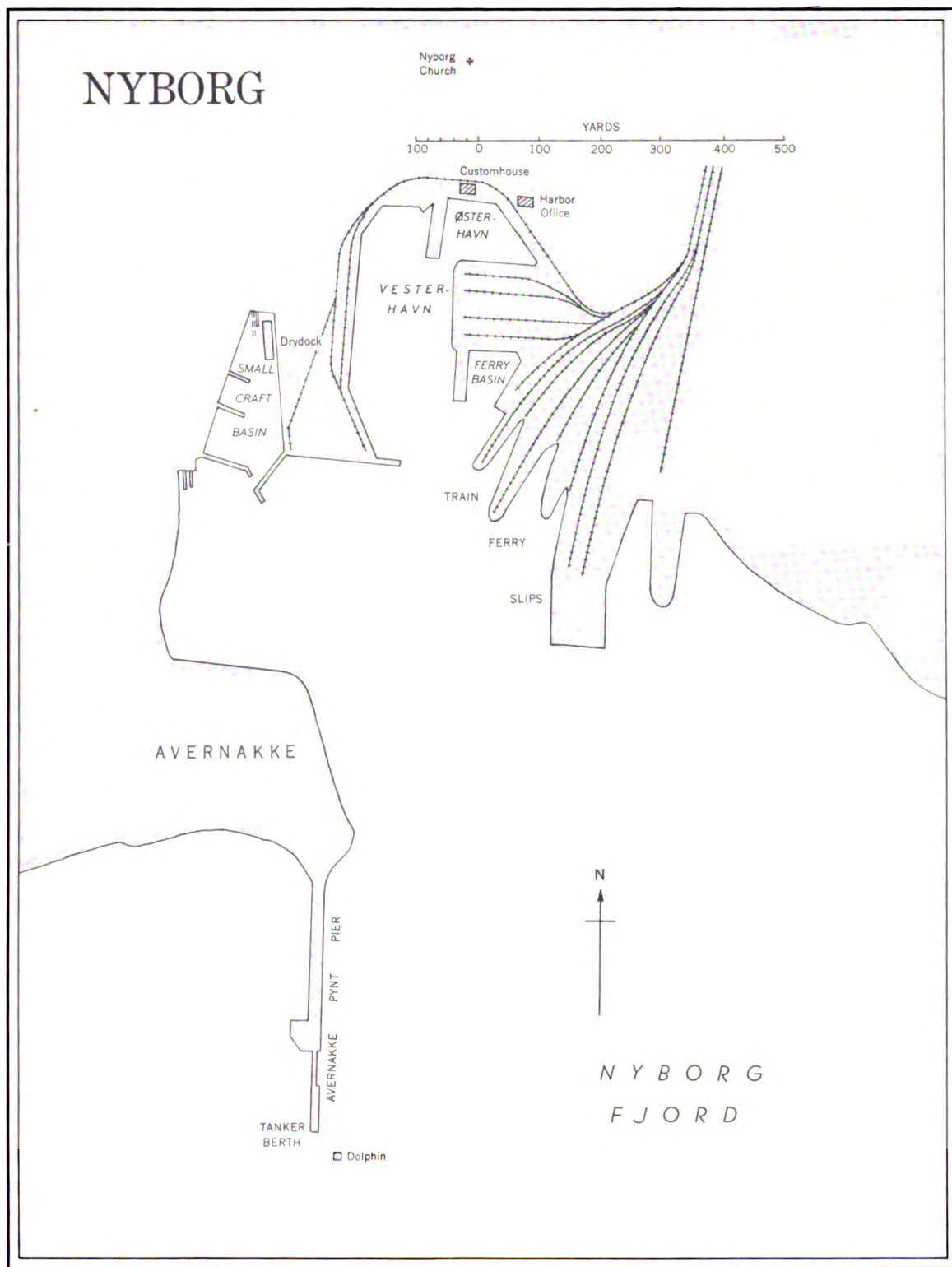
A light is shown on the head of the breakwater on the eastern side of the entrance of the small craft basin.

Lights are shown at the train ferry berths when ferries are arriving or departing. A fog signal is sounded when a ferry is expected. Two range lights are shown at the northeastern corner of Vesterhavn when a vehicular ferry is entering the harbor.

PILOTS can be obtained from the station at Slipshavn. See also section 1-37.

DIRECTIONS.—See section 2B-11.

FACILITIES.—The town of Nyborg is situated on low ground that slopes down to the shore. The main part of the town is built around the church, which is located a short distance northward of Osterhavn. The population is 11,566 (1966). Nyborg is one of Denmark's principal distributing centers for petroleum products and is the site of important facilities for the (continued on pg. 100)



repair of railroad rolling stock. The chief activity of the port is the ferry service across Store Bælt, but there is also considerable cargo traffic to and from the berths in the harbor basins and at Avernakke. Imports consist mainly of petroleum products, coal, coke, grain, fodder, and cotton. Agricultural products are the principal exports. This is a first port of entry.

The mole at the outer end of Avernakke Pynt Pier has a berthing length of 210 feet on each side. The depth alongside is 5.3 m (17.3 ft.) on the eastern side and 6.0 m (19.6 ft.) close off the western side. The depth at the head of the pier is 10.0 m (32.8 ft.), and a vessel can berth in this depth by securing to the pier and to the dolphin southeastward of the pierhead.

The head of the mole which forms the western side of Vesterhavn has about 500 feet of berthing space with depths of 2.4 to 3.1 m (7.8 to 10.1 ft.) alongside.

The southern part of the western quay in Vesterhavn has a berthing length of 375 feet, and the remainder of the quay has a berthing length of 700 feet. The depth alongside the quay is 7.5 m (24.6 ft.) except at the northern end, where it is 7.0 m (22.9 ft.). The western side of the mole extending southward between Vesterhavn and the ferry harbor has a usable length of 200 feet and a depth alongside of 5.0 m (16.4 ft.). Extending northward from the root of this mole is a quay with a length of 360 feet and depths alongside of 5.5 to 6.8 m (18.0 to 22.3 ft.). The quay westward of the vehicular ferry berth and the western side of the mole between Vesterhavn and Osterhavn are not available for general berthing.

The quays on the northeastern, southern, and western sides of Osterhavn have berthing lengths of 290, 325, and 225 feet, respectively; the depth alongside these quays is 18 feet. The quay on the northern side of the basin is 225 feet long and has a depth of 13 feet alongside.

In the small-craft basin there are berths for fishing boats and yachts in depths of 8 to 11 1/2 feet.

The slips and basin at the ferry terminal are for the use of vessels of the Danish State Railways only.

An 8-ton crane is located on the western quay in Vesterhavn. The principal quays are served by rail.

Provisions are plentiful. Water is laid on to most of the quays in the harbor and to Avernakke Pynt Pier. Fuel oil, diesel oil, and coal can be obtained. Repair facilities consist of a floating drydock with a lifting power of 500 tons, a small-craft building and repair yard containing a marine railway, a machine shop, an iron foundry, and the railroad repair shops.

There is railroad communication with all parts of Denmark and with other European countries. Vehicular ferries ply between Nyborg and Korsør.

A hospital is available.

DIRECTIONS FOR THE CENTRAL PART OF STORE BÆLT

2B-13 Through Østerrenden to Langelands Bælt.—Having passed about midway between Romsø Tue and Elefantgrund, as directed in section 2A-14, a vessel should steer a south-southeasterly course for a position about 3 miles westward of the northwestern extremity of Halsskov, and from this position she should steer to pass about 1/2 mile eastward of the buoy marking Sprogø Nordøst Pulle, about 1/3 mile eastward of the buoy moored east-northeastward of Sprogø Østerrev, and about 1/4 mile westward of Halsskov Lightship.

After passing the lightship, the vessel should continue on a southerly course to a position about 3 1/2 miles southeastward of the eastern end of Sprogø, and from this position she should steer a south-southeasterly course through the deep channel toward the church on Omø. When the vessel is northeastward of the buoy marking the 5-fathom patch lying about 3 miles westward of the northern end of Agersø, course should be altered southward to pass between Vengeancegrund and Agersø Flak. From a position about 1/4 mile westward of the buoy marking the western extremity of Agersø Flak the vessel should steer for a position about 3 miles northwestward of Langelands Øre (sec. 2B-5). At the latter position course should be altered southward to proceed into Langelands Bælt as directed in section 2C-9.

At night, Sprogø Light, Halsskov Lightship, and Korsør Light are good guides for approaching Østerrenden. After clearing Østerrenden, the sectors of Omø Light and Hov Light (sec. 2C-1) can be utilized for passing between Vengeancegrund and Agersø Flak and entering Langelands Bælt.

Deep-draft vessels should always pass eastward of Vengeancegrund.

Through Vesterrenden to Langelands Bælt.—After passing about midway between Romsø Tue and Elefantgrund as previously directed, a vessel should steer for a position about 1 mile eastward of Knudshoved, and thence proceed on an easterly course to pass between Sprogø Puller on the north, and Vestlige Puller and Østlige Puller on the south. Care should be taken by deep-draft vessels to avoid the 5 1/4-fathom patch lying about 2 miles eastward of

Knudshoven. When the vessel is southward of the eastern end of Sprogo she should steer a southeasterly course to a position in Dybe Rende about 3 miles westward of Egholm; thence the vessel should pass between Vengeancegrund and Agerso Flak as previously directed. Vessels of suitable draft can cross Broen between Vengeancegrund and the patches on the southwestern part of the bank.

At night, the lights on Sprogo, Knudshoven, and Omo afford guidance. Between Elefantgrund and Knudshoven a deep-draft vessel should keep in a depth of at least 10 fathoms.

In thick weather it is advisable for vessels to anchor near Knudshoven until the visibility improves.

ANCHORAGES

2B-14 OFF KORSOR.—See section 2B-8.
 NYBORG FJORD.—See section 2B-11.

Part C. LANGE LANDS BAELT

2C-1 OMO (western extremity, 55° 10' N., 11° 08' E.), on the eastern side of the northern entrance of Langelands Baelt, is described in section 2B-5.

HOV, the extreme northern part of Langeland, terminates northward in Lille Hov, a small, steep bluff lying about 6 3/4 miles westward of Omo. A short distance southward of Lille Hov is Frankeklint, a bluff which appears yellow from seaward.

FRANKEKLINT LIGHT is shown on the bluff of that name.

HOV LIGHT is shown on the eastern side of Hov about 1 mile south-southeastward of Lille Hov.

HOV SAND, a portion of the shorebank at the northern end of Langeland, extends up to 1 1/4 miles northward from Lille Hov to the 3-fathom curve. There are irregular depths of 4 to 8 fathoms northward of Hov Sand up to a distance of 1 3/4 miles from Lille Hov; the depths are also irregular between the 3-fathom curve northeastward of Hov and the deep channel at the southwestern end of Broen (sec. 2B-5). The western side of Hov Sand is steep-to.

The northern extremity and western side of Hov Sand are marked respectively by a buoy moored in a depth of 3 3/4 fathoms about 1 1/3 miles north-northeastward of Lille Hov and a buoy moored in a depth of 5 1/4 fathoms about 1 mile north-northwestward of that bluff.

Three wrecks, with depths of 5.5, 5.9 and 5.6 m (3.0, 3.2 and 3.0 fm.), lie respectively about 1 mile northeastward, 1 1/2 miles northeastward, and 1 1/4 miles east-northeastward of Lille Hov.

GENERAL REMARKS

2C-2 Langelands Baelt, the part of Store Baelt lying eastward of Langeland, is entered from northward between Omo and Hov. It is bounded on the east by the line (sec. 2-1) separating Smaalands Farvandet from Store Baelt and by the west coast of Lolland. The fairway through Langelands Baelt has a least width of about 3 miles between the 6-fathom curves on either side; there are few off-lying dangers.

The only port of any importance in Langelands Baelt is Nakskov, which is situated at the head of Nakskov Fjord, an indentation of the west coast of Lolland.

DEPTHS—OFF-LYING DANGERS

2C-3 With the exception of a few patches in the northern part of the fairway, the depths between the 6-fathom curves range from 6 1/4 to 31 1/2 fathoms. The deepest water is in Dybe Rende, which is described in section 2-2.

Eastward of the northern end of Langeland, Dybe Rende is divided into two branches by a bank which has depths of less than 10 fathoms and extends about 4 3/4 miles southward from a position about midway between Langelands Ore and Lille Hov. The least depth of this bank, 5 1/2 fathoms, is near its western edge and about 2 miles east-southeastward of Hov Light. The two branches of Dybe Rende rejoin eastward of Snode Ore (sec. 2C-6).

A $5\frac{3}{4}$ -fathom patch lies about $1\frac{2}{3}$ miles south-southeastward of Hov Light and $\frac{3}{4}$ mile offshore. Several patches with depths of $5\frac{1}{2}$ to 6 fathoms lie between the 6- and 10-fathom curves on the eastern side of the northern part of the fairway.

Dangers southward of the southern end of Langeland are described in section 3D-10.

Wrecks.—A wreck with a depth of $9\frac{1}{4}$ fathoms lies about $2\frac{1}{2}$ miles southeastward of Snøde Øre another wreck with a depth of $8\frac{1}{2}$ fathoms lies about 4 miles east-northeastward of the same point. Two wrecks, each of which has a depth of 7 fathoms, lie respectively about $2\frac{1}{2}$ miles east-northeastward and $2\frac{1}{4}$ miles east-southeastward of Tranekær Light (sec. 2C-6); a wreck, with a depth of 14.3 m (7.8 fm), lies about $3\frac{1}{2}$ miles south-southwestward of the light. A wreck with a depth of 6 fathoms is located on the eastern side of the fairway about 3 miles west-southwestward of the northern extremity of Albuen (sec. 2C-8).

Wrecks in the southern approaches to Langelands Bælt are located as follows from the southern extremity of Langeland: 10.0, 12.0 and 12.0 m (5.4, 6.5 and 6.5 fm) lying, respectively, 2, $3\frac{1}{2}$ and $6\frac{1}{2}$ miles eastward; 16.0 and 6.7 m (8.7 and 3.6 fm) lying, respectively, 3 and $6\frac{1}{2}$ miles east-southeastward.

Wrecks inshore of the 6-fathom curves are mentioned in the descriptions of the respective sides of Langelands Bælt.

CURRENTS

2C-4 The currents in Langelands Bælt sometimes attain a velocity of 3 knots. They are strongest near the Langeland coast and usually follow its direction. Between Spodsbjerg and the southern end of Langeland, however, the northgoing current sets toward the western shore, and when it is strong it causes a counter-current close inshore which can be used to advantage by small vessels. Farther offshore both the northgoing and southgoing currents usually follow the direction of Dybe Rende.

ICE

2C-5 See section 2-7

EAST COAST OF LANGELAND

2C-6 The eastern side of Langeland, which forms the western side of Langelands Bælt, extends from Lille Hov to Dovns Klint, the southern extremity of the island, about 28 miles south-southwestward. This coast is hilly in contrast to the west coast of Lolland, which is low and flat, and there are many woods.

Between Hov Light and Tranekær Light, about 10 miles south-southwestward, the coast is nearly straight. Snøde Øre is a slight projection about 4 miles south-southwestward of Hov Light. Landmarks within this part of the coast are Stoense Church and Snøde Church, both of which are white, located about $3\frac{3}{4}$ and $4\frac{1}{3}$ miles, respectively, south-southwestward of Hov Light; the large red main building of Nedergaard, which is situated about $1\frac{1}{2}$ miles southward of Snøde Church and is surrounded by woods; Tranekær Castle, a red structure surmounted by a spire and standing on high ground about $3\frac{3}{4}$ miles south-southwestward of Nedergaard; and Tranekær Church, which has a tall spire and is located about $\frac{1}{2}$ mile south-westward of the castle.

The shorebank along this stretch of coast extends about $\frac{1}{4}$ to $\frac{1}{2}$ mile to the 3-fathom curve. The 6-fathom curve is about $\frac{1}{2}$ mile offshore eastward of Hov Light and about $\frac{1}{3}$ mile offshore southeastward of Tranekær Light, but it lies up to $1\frac{1}{4}$ miles off the coast between these lights. The bottom along the east coast of Langeland is sand, with rocks in some places. **Tetens Grurd**, a rocky patch with a depth of $1\frac{3}{4}$ fathoms, lies just inside the 3-fathom curve in a position about 1 mile north-northeastward of Snøde Øre and $\frac{1}{2}$ mile offshore. **Snøde Rev**, a reef with depths of 1 to $1\frac{3}{4}$ fathoms, extends about $\frac{1}{3}$ mile from the shore nearly $\frac{3}{4}$ mile south-southwestward of Snøde Øre. A sandy spit, on which is a depth of 5 feet, projects about $\frac{1}{3}$ mile from the shore nearly $\frac{1}{2}$ mile north-northeastward of Tranekær Light.

TRANEKÆR LIGHT (54° 59' N., 10° 53' E.) is shown on the coast in a position about 1 2/3 miles east-southeastward of Tranekær Church. A FOG SIGNAL is sounded.

THE COAST BETWEEN TRANEKÆR LIGHT AND DOVNS KLINT trends in a general south-southwesterly direction and has no significant indentations nor projections. At Spodsbjerg, a village about 3 3/4 miles south-southwestward of Tranekær Light, there is a small fishing harbor and a pier.

The landmarks on this part of Langeland are mainly village churches and farm buildings. Tullebølle Church, which has a square tower, is located about 2 2/3 miles south-southwestward of Tranekær Church; it is visible only from southeastward. Longelse Church, painted white and partially obscured by trees, stands about 2 miles southward of Tullebølle Church. Fuglsbølle Church, on which is a slender spire, and Skovsgaard, a large red building with a spire, are situated about 2 miles southwestward and 5 miles south-southwestward, respectively, of Longelse Church. Hjortholm, a large farmhouse nearly 1 1/2 miles southward of Skovsgaard, and Tryggelev Church, which has a square tower and a chimney close northeastward and stands about 2 1/4 miles west-southwestward of Hjortholm, are conspicuous from southeastward. Magleby Church, a white structure with a dark spire, is located about 2 miles southward of Tryggelev Church.

On the southeastern side of Gulstav, the extreme southern part of Langeland, the tall square tower of Keldsnor Light is a very prominent landmark. Gulstav terminates southward in Dovns Klint, which is described in section 3D-10.

KELDSNOR LIGHT (Kjels-Nor), is shown in a position about 1 mile east-northeastward of Dovns Klint. A FOG SIGNAL is sounded.

A light buoy is moored about 1/2 mile offshore about 4 miles north-northeastward of Keldsnor Light.

The 6-fathom curve is no more than 1 mile off the coast between Tranekær Light and Keldsnor Light. The shorebank to the 3-fathom curve does not exceed about 1/3 mile in width except where NÆBBEREVLER, a

group of sandbars with depths of less than 3 feet, extend up to 1/2 mile from the coast between 1/2 mile and 2 1/4 miles southward of Spodsbjerg Havn. The outer edge of NÆBBEREVLER is steep-to, the depths increasing abruptly from about 1 fathom to over 7 fathoms. Similar sandbars lie close inshore along the coast southward of Næbberevler, but the depths outside them increase more gradually.

A WRECK with a depth of 5 1/2 fathoms lies nearly 1 mile eastward of Keldsnor Light.

A PROHIBITED ANCHORAGE AREA, centered about 3 1/2 miles northeastward of Keldsnor Light, extends about 3 miles offshore from the southeastern extremity of Langeland.

SPODSBJERG HAVN comprises an artificial harbor for fishing craft and a ferry harbor, protected on its northeastern side by a breakwater. There is a depth of 14 3/4 feet in the ferry harbor and alongside the quay there. The fishing harbor has 9 3/4 feet in the entrance and alongside the quay on its eastern side; the remainder of the fishing harbor has a depth of about 8 feet. Gales from northwest through north to east may raise the water level about 4 feet, and those between south and west may lower it the same amount.

A LIGHT is shown on the northern side of the entrance of the ferry harbor; a FOG SIGNAL is sounded on the southern side of the entrance. A light is shown occasionally on the southern side of the entrance of the fishing harbor.

EASTERN SIDE OF LANGE LANDS BÆLT—OMØ TO LOLLAND

2C-7 Between Omø and the northern side of Lolland the depths are very irregular, and there are numerous shoals and rocky patches between the shorebanks which extend considerable distances from the two islands. Because of these dangers and the lack of suitable landmarks, only small vessels can navigate

in this area. For such vessels there are two marked channels which afford access to Smaalands Farvandet from Store Bælt.

OMØ TOFTE, with depths of less than 3 fathoms, projects about 3 1/2 miles southward from Omø. Its shoalest part lies near its center and has a depth of only 2 feet. A rocky patch and a WRECK, each having a depth of 6 feet, lie respectively about 1/4 mile southeastward and 1 mile south-southeastward of the southern extremity of Omø. A channel in which the least depth is 11 feet crosses the northern part of Omø Tofte about 1/2 mile southeastward of Omø. The northern side of this channel is marked by a can BUOY and its southern side by a conical BUOY with a white reflector. The bottom in the channel is sand, and on the shoaler parts of Omø Tofte it is sand and rock.

OMØ STAALGRUNDE, two large shoals having depths of less than 3 fathoms, lie with their northern extremities about 3 1/4 miles south-southeastward and 4 miles southward of Omø. The northeastern shoal, with a least depth of 1 1/4 fathoms, is separated from the southern end of Omø Tofte by a narrow channel in which the depths are from 7 to 10 fathoms. The southwestern shoal, which has a least depth of 1 1/2 fathoms, is separated from Omø Tofte and the northeastern shoal by a channel having a least depth of 3 3/4 fathoms in the fairway. The bottom on both shoals consists of sand, weed, and rocks. The southern extremity of the southwestern shoal is marked by a can BUOY moored in a depth of 3 1/2 fathoms about 6 miles southward of Omø.

Westward of Omø Tofte and Omø Staalgrunde the 6-fathom curve on the eastern side of the fairway in Langelands Bælt trends in a general southerly direction for about 6 1/2 miles from a position about 1 1/2 miles westward of the southern end of Omø. Several 3-fathom patches lie between this 6-fathom curve and the 3-fathom curves on the western sides of Omø Tofte and Omø Staalgrunde.

Between Omø Staalgrunde and the shore-bank fringing the northern side of Lolland are many detached shoals. A WRECK with a depth of 4 1/2 fathoms lies about 3 1/2 miles north-northeastward of the eastern entrance point of Onsevig (sec. 2C-8). Vessels can enter Smaalands Farvandet from Langelands Bælt in a least depth of 4 fathoms by passing a short distance southward of the buoy marking the southern extremity of Omø Staalgrunde.

WEST COAST OF LOLLAND

2C-8 The southern part of the eastern side of Langelands Bælt is formed by the coast of Lolland between KLINTEODDE, which lies about 11 1/2 miles southward of Omø and is the eastern entrance point of Onsevig, and the southern limit of Store Bælt, about 11 1/2 miles south-southwestward. Nakskov Fjord indents this coast between a point lying nearly 5 1/2 miles southwestward of Klinteodde and ALBUEN, a low peninsula about 3 miles farther southwestward.

The western side of Lolland is low, flat, and wooded, and there are few prominent landmarks. Utterslev Church and Vindeby Church, both of which are white, are located respectively about 3 miles east-southeastward and 2 1/4 miles southeastward of Klinteodde. Købelev Church, which is red, stands about 1 3/4 miles southwestward of Vindeby Church, and Sandby Church painted white and having a pointed tower, is about 2 miles farther southwestward. Nakskov Church, which has a spire, is located about 3 miles south-southeastward of Sandby Church. About 1/2 mile eastward of Nakskov Church is a tall factory chimney.

Near the outer end of Albuen, which is connected with the land south-southeastward by a long, narrow isthmus, are the buildings of a pilot station and a lighthouse; these structures are visible from a considerable distance. Kappel Church, painted white and surmounted by a pointed tower, is situated

about 4 1/2 miles south-southeastward of the northern extremity of Albuen.

The shorebank fringing the coast between Klinteodde and the northeastern entrance point of Nakskov Fjord has irregular depths to the 3-fathom curve, which lies about 2 1/4 miles northward and northwestward of the former point and about 2 miles westward of the latter; there are depths greater than 3 fathoms in some places. The bottom is sand and mud, with some rocks, especially near the coast in the vicinity of Onsevig. A buoy marking the edge of the shorebank is moored in a depth of 3 1/4 fathoms about 2 1/3 miles northwestward of Klinteodde. Depths of less than 6 fathoms, interspersed with greater depths, extend up to 6 1/4 miles north-northwestward and 4 miles northwestward from Klinteodde, and up to 3 1/4 miles from the coast between Onsevig and Nakskov Fjord. Vensholm, a narrow islet, lies on the shorebank about 2 1/4 miles west-southwestward of Klinteodde and about 1/3 mile offshore. Vensholm Sund, a blind channel with a depth of 5.3 m (17.3 ft.) and a bar with 2.2 m (7.2 ft.), leads northeastward to a position between the southwestern end of Vensholm and the Lolland coast.

Dangers off the entrance of Nakskov Fjord are described in section 2C-10.

There are depths of less than 6 fathoms within a distance of about 2 1/2 miles northwestward of Albuen, and thence southward to the southern limit of Store Bælt the 6-fathom curve lies 2 to 3 1/4 miles offshore. The shorebank within the 3-fathom curve off this stretch has a width of 1/2 mile to 1 1/2 miles. Albue Triller, which consists of sandbars with depths of 0.6 to 2.0 m (1.9 to 6.5 ft.), extends about 3/4 mile westward from Albuen. A buoy is moored in a depth of 4 fathoms off the northwestern side of Albue Triller, which is steep-to. Albue Flak, with depths of less than 6 fathoms, extends about 2 1/3 miles westward from Albuen immediately southward of Albue Triller; the bottom is sand, with rocks in some places. The western edge of Albue Flak is marked by a buoy.

WRECKS.—A wreck with a depth of 5 feet lies about 3/4 mile northwestward of the northwestern end of Vensholm, and a wreck with a depth of 1 3/4 fathoms lies about 1/2 mile west-northwestward of the northeastern entrance point of Nakskov Fjord. Three wrecks with depths of 1 1/4, 3 3/4, and 3 1/4 fathoms lie respectively about 1, 2 1/2, and 2 3/4 miles southwestward of the northern extremity of Albuen, and a wreck with a depth of 3 1/2 fathoms lies nearly 1 1/2 miles west-southwestward of the inner end of Albuen isthmus.

ONSEVIG (54°57' N., 11°07' E.), a shallow inlet with wooded sides, indents the coast of Lolland between Klinteodde and Nojsomheds Odde, about 1 mile west-southwestward. A channel, marked by spar buoys, leads in a south-southeasterly direction to a basin with depths of 1 to 2 1/2 fathoms in the shorebank off the entrance of the inlet. This basin affords sheltered anchorage to small vessels of suitable draft. A drying rock lies about 1/2 mile north-northwestward of Klinteodde, and underwater rocks lie on both sides of the channel and basin.

A small offshore harbor is situated on the eastern side of the entrance of Onsevig and is connected to the shore by a causeway. There is a depth of 2.0 m (6.5 ft.) in the harbor and 2.5 m (8.2 ft.) in the entrance channel. The water level is raised by winds between northeast and east, and it is lowered by winds between southwest and west. A light is shown on the head of the breakwater forming the northwestern side of the harbor. Two range lights are shown at the northwestern extremity of the harbor and on the southern breakwater, respectively; these lights in range 158° lead between the buoys on either side of the approach channel. A vessel can anchor in a depth of 4.0 m (13.1 ft.) about 400 yards north-northwestward of the harbor. Pilots can be obtained from Albuen.

A beacon for the guidance of fishing craft stands on Nojsomheds Odde; it is an iron framework structure with slats on its upper part and is about 30 feet high.

ALBUEN LIGHT is shown on the northern part of Albuen. The lights in Nakskov Fjord, including Taars Light, which is located on the northeastern side of the fjord near the entrance and is visible across Langelands Baelt, are described in section 2C-11.

PILOTS from the station on Albuen will take vessels to Nakskov, Korsor, and Nyborg, and through Smaalands Farvandet as far as Masnedo. When ice or other unfavorable conditions make it difficult for a pilot to approach a vessel, the pilot signal made by the vessel will be answered during daylight by the International Code flag "C" or "N" to indicate whether the pilot will or will not attempt to board.

See also section 1-37.

DIRECTIONS FOR LANGE LANDS BAELT

2C-9 As the fairway of Langelands Baelt is relatively wide and free from dangers, and the depths in it are sufficient for deep-draft vessels, passage through it presents no difficulty. A southbound vessel can steer a direct course from a position about 3 miles northwestward of Langelands Ore (sec. 2B-13) to a position about 2 miles eastward of Keldsnor Light. This course passes about 1 mile eastward of the shoalest part of the bank (sec. 2C-3) which divides Dybe Rende eastward of the northern end of Langeland. Albuen should be given a berth of not less than 3 miles in order to avoid the dangers off the entrance of Nakskov Fjord.

At night, Omo, Hov, Tranekaer, Albuen, and Keldsnor Lights are good guides.

During thick weather a vessel can keep in Dybe Rende by sounding. The fog signals at Tranekaer and Keldsnor Lights are of assistance under such conditions.

A vessel bound through Langelands Baelt from southward should steer for a position about 2 miles eastward of Keldsnor Light and then proceed according to the directions given for a vessel from northward in the reverse order.

If approaching from southwestward at night, a vessel should steer to pass about 2 1/2 miles eastward of Keldsnor Light, taking care to give Gulstav Flak (sec. 3D-10) a wide berth. A vessel coming from Fehmarn-belt should steer for Keldsnor Light, but should not close the Langeland coast until Albuen Light is sighted northeastward; the latter light shows red from this direction and may be difficult to pick up.

After sighting Albuen Light and passing eastward of Keldsnor Light, the vessel should steer for a position about 1 1/2 miles eastward of Tranekaer Light, which should be sighted in time to lead clear of the dangers off the entrance of Nakskov Fjord. From the position eastward of Tranekaer Light the vessel should steer to pass about 3 miles eastward of Hov Light, and thence she should continue northward by following in reverse order the directions given for a southbound vessel.

CAUTION.—Vessels transiting Langelands Baelt should observe the prohibited and danger areas, described in sections 3D-10 and 5A-8, which lie in the southern approach to this channel.

NAKSKOV FJORD

2C-10 Nakskov Fjord extends about 3 miles southeastward from its entrance (sec. 2C-8), and then turns eastward for about 2 miles to its head, where the town and harbor of Nakskov are situated. It is mostly shallow, but a narrow channel leads through it to Nakskov.

The northeastern side of the fjord is indented by several small bays, the outermost of which, Taars Vig, is entered immediately southeastward of the northeastern entrance point of the fjord. The outer part of the southern side is formed by Albuen, and the remainder of this side consists mainly of embankments built around reclaimed areas between former islands and peninsulas. Some of the principal land- (continued on page 107)

marks in the vicinity of Nakskov Fjord are described in section 2C-8.

Enehøje ($54^{\circ}50' N.$, $11^{\circ}01' E.$), the largest of several islands in the fjord, lies nearly $1\frac{1}{4}$ miles south-southwestward of the southern entrance point of Taars Vig; it is 52 feet high and has a triangulation station on its highest part. Rommersholm is an islet lying about $\frac{1}{4}$ mile east-northeastward of the eastern extremity of Enehøje. Vejlø and Slotø lie respectively nearly $\frac{1}{2}$ mile east-northeastward and $\frac{2}{3}$ mile east-southeastward of Rommersholm. A 490-foot pier extends from the eastern side of Enehøje and small piers extend from Slotø and Vejlø. Four islets lie between Slotø and the southern side of the fjord. Kuddeholm is located about 1 mile east-southeastward of Slotø, and Barneholm is close southward of the former.

Channels and dangers.—A channel having a least depth of $20\frac{1}{2}$ feet and a minimum bottom width of about 100 feet leads from the entrance of the fjord to Nakskov. A secondary channel, formerly a part of the main channel, branches from the $20\frac{1}{2}$ -foot channel close southward of Enehøje, passes northward of Slotø, and rejoins the main channel a short distance westward of Kuddeholm. A channel with a least depth of 5.5 m (3.0 fm) leads from westward across the shorebanks to Taars Vig, and there are other channels for small craft in various parts of the fjord.

Except in the main channel and the channel that passes northward of Slotø the depths in the fjord are less than 3 fathoms in the outer part and less than 3 feet in most of the inner part. There are flats and patches with depths of less than 3 fathoms up to 2 miles off the entrance of the fjord.

A 6-foot rocky patch, marked on its southwestern side by a buoy, lies on the shorebank about $\frac{3}{4}$ mile westward of the northeastern entrance point of Nakskov Fjord. A spit with depths of less than 6 feet extends about $\frac{1}{2}$ mile westward from the southern entrance point of Taars Vig, and Bjørnegrund, a rocky patch with a least depth of 3 feet, lies about 1 mile westward of the same point.

On the northern side of the approach channel to the fjord is **Hvidegrund Flak**, which has a least depth of 5 feet. A spar buoy is moored in a depth of $1\frac{3}{4}$ fathoms on the northern side of Hvidegrund Flak in a position about $1\frac{1}{2}$ miles westward of the southern entrance point of Taars Vig, and a buoy is moored in a depth of $3\frac{1}{4}$ fathoms at the southwestern extremity of the flat and about $1\frac{1}{2}$ miles north-northwestward of Albuen. A lighted buoy is moored about 2 miles north-northwestward of Albuen. A 3-fathom patch lies on the southern side of the approach channel in a position about 1 mile north-northwestward of Albuen; its northern side is marked by a buoy moored in a depth of $3\frac{3}{4}$ fathoms.

A 3-fathom patch lies nearly $1\frac{1}{4}$ miles northward of Albuen, and its southeastern side is marked by a spar buoy moored in a depth of about 5.9 m (3.2 fm). Hvidegrund, with a least depth of 0.6 m (1.9 ft.), lies close westward of the northern part of Enehøje. A $1\frac{3}{4}$ -fathom patch lies about 1 mile westward of the northern end of Enehøje; two spar buoys moored close southwestward and about $\frac{1}{4}$ mile southeastward, respectively, of this patch mark the northern side of the entrance channel.

Between Hvidegrund and Albuen, and on the southern side of the entrance channel, is **Ryggen**, which consists of two rocky flats with least depths of $1\frac{1}{2}$ fathoms on the western one and $1\frac{1}{4}$ fathoms on the eastern. A flat extends northward from Ryggen to the southern side of the entrance channel, which is nearly 1 mile north-northeastward of Albuen, and is marked by two spar buoys with white reflectors.

After passing northward of Ryggen the channel trends southward for about $\frac{1}{2}$ mile and then turns southeastward to a position close southward of Enehøje. **Knølen**, a rocky flat with a least depth of 3 feet, and **Malø Grund**, which has a least depth of about 1 foot, lie on the northern and southern sides, respectively, of this part of the channel.

From the entrance of the fjord to Enehøje the channel is dredged where necessary to maintain a least depth of 20½ feet, and from Enehøje a 20½-foot dredged channel leads eastward to the harbor of Nakskov, passing between Kuddeholm and Barneholm. The old channel that leads northward of Slotø is narrow and winding. The main channel and the old channel are **buoyed** in accordance with the Danish uniform system.

In addition to the buoyage there are several lights and beacons which lead through the various reaches of the main channel and through some portions of the old channel. These aids are described below.

2C-11 Tidal currents.—The ingoing and outgoing tidal currents alternate regularly about every 6 hours during settled weather. They follow the direction of the channel and are strongest eastward of Enehøje.

Ice.—See table 4 in chapter 1 for ice information.

Navigational aids.—Two range lights are shown on the southern part of Enehøje. These lights in range 120° lead through the outer part of the entrance channel.

Two lights are shown near the western extremity of Lango; in range 176°, they lead through the channel between Ryggen and Knølen.

Albuen Front Light is shown in a position nearly ⅓ mile eastward of Albuen Light (sec. 2C-8) and in range 275° with the latter leads between Knølen and Malø Grund.

Ramsø Light is shown in a position nearly ⅓ mile south-southeastward of Enehøje, and Bogø Light is shown in a position about ½ mile south-eastward of Ramsø Light. These lights in range 130° lead from the light buoy marking Malø Grund to the junction of the dredged channel and the old channel southward of Enehøje.

Vesterodde Light is shown in a position close northward of the western extremity of Langø. This light in range 264° with Ramsø Light leads through the dredged channel as far as Barneholm.

Two lights are shown from the northern side of the entrance to Nakskov; in range 063°, they lead through the channel northeastward of Barneholm.

Range beacons for part of the old channel stand on the southern part of Enehøje and the southwestern end of Vejlo.

Taars Light is shown on the eastern side of Taars Vig. Lights shown at Langø Havn, on the northern side of Langø, are described with the harbor.

The buoyage of the principal channels and dangers is described with those features. Several spar buoys moored westward of Vejlo mark a small craft channel, and spar buoys mark the approach channel to Langø Havn.

Submarine cables.—A submarine cable is laid from the western extremity of Langø to the northeastern part of Albuen. Cables are also laid between the eastern extremity of Enehøje and Vejlo, between Vejlo and Slotø, and between Vejlo and the northeastern side of the fjord.

Taars Fishing Harbor, located on the northern side of Taars Vig, is a small offshore basin which is connected to the shore by a causeway. It has depths of 1.8 m (5.9 ft.) (1968). Gales between north-northeast and east-southeast may raise the water level 4 feet, and southwesterly gales may lower it the same amount.

Lange Havn, about 3/4 mile southward of Enehoje, is formed by two moles extending from the shore. The entrance, which is about 50 feet wide, is approached from northward through a channel marked by spar buoys in accordance with the Danish uniform system. The approach channel and the harbor have depths of 3.1 and 1.2 to 3.0 m (10.1 and 6.5 to 9.8 ft.), respectively. Two range lights are shown on the western mole and on the shore south-southwestward of that mole, respectively; these lights in range 169° lead through the approach channel.

Anchorage.—Only small vessels can anchor in Nakskov Fjord. In the outer part of Taars Vig and off the entrance of that bay there is anchorage in depths of 1 1/4 to 2 fathoms. Albue Red, the area between Albuen and Ryggen, affords anchorage in depths of 2 to 3 fathoms, clay, sand, and weed; westerly and west-northwesterly winds may raise some sea, but a vessel with good ground tackle should be able to ride out a gale. Albue Havn, a bay on the eastern side of Albuen, is available only for boats. Small craft can also anchor in parts of the old channel.

Pilots for Nakskov Fjord can be obtained from Albuen. See also section 2C-8.

Directions.—As the channel through Nakskov Fjord is mostly narrow and the outer part is winding, it is inadvisable for a vessel to enter the fjord without a pilot. A vessel approaching the entrance from northward should take care to pass well clear westward of a shoal with a least depth of 2 3/4 fathoms lying about 2 1/2 miles westward of the northeastern entrance point of the fjord. A vessel from southward should give Albue Flak a wide berth and should take care to avoid several patches with depths of 3 to 3 1/4 fathoms which lie up to 1 3/4 miles west-north-

westward of Albuen Light. Having arrived off the entrance of the fjord, a vessel should pass between the can buoy marking the southwestern extremity of Hvidegrund Flak and the conical buoy marking the northern side of the 3-fathom patch which lies about 1 mile north-northwestward of Albuen. Thence the vessel should proceed through the channel with the guidance of the buoys and ranges previously described.

A vessel can approach the anchorage in the entrance of Taars Vig by keeping Sandby Church (sec. 2C-8) in range 093° with Taars Light. This range leads over a least depth of 2 fathoms.

NAKSKOV

Position: 54°50'N., 11°08'E.
Depths: Approach channel, 6.3 m (20.6 ft.).
 Outer harbor, 0.2 to 6.3 m (0.6 to 20.6 ft.).
 Inner harbor, 2.0 to 6.3 m (6.5 to 20.6 ft.).
 Berths, 2.0 to 6.3 m (6.5 to 20.6 ft.).

Tidal range: Slight.

2C-12 The port of Nakskov comprises a narrow winding inlet at the head of Nakskov Fjord. The entrance is northward of a point lying about 1/2 mile east-northeastward of Barneholm. On the northern side of the entrance is Rosnæs, a suburb of Nakskov. The eastern limit of the port is at Nybro, a fixed bridge which crosses the inlet about 1 mile east-southeastward of the entrance. Beyond Nybro the inlet widens and forms Indrefjord, which is not navigable. Nakskov is the largest port on Lolland.

Tides and water level.—The tidal range is very small.

The water level may be raised as much as 5 feet by gales between northeast and east, and it may be lowered as much as 3 feet by gales between southwest and west.

Ice.—See table 4 in chapter 1 for information. An icebreaker is available.

Harbor.—The outer harbor extends eastward from the entrance of the port for nearly $\frac{3}{8}$ mile. A prolongation of the 20½-foot dredged approach channel (sec. 2C-10) leads through this part of the harbor and is marked by several spar buoys. Eastward of Rosnæs the northern part of the outer harbor is divided into two basins by a mole projecting southeastward. The western basin, which has depths of 0.2 to 4.8 m (0.6 to 15.7 ft.) in its eastern and northern parts, is mainly unimproved. The eastern basin is used for the idle mooring of vessels, and a grain quay is located on its eastern side; there are depths of 5.5 to 6.3 m (18.0 to 20.6 ft.) in this basin. A small marine railway is situated on the western side of this basin.

The western part of the southern side of the outer harbor consists largely of reclaimed land, and the eastern part is occupied by a shipyard, on the western side of which is a basin.

The inner harbor is entered between the southern end of the grain quay in the outer harbor and the northeastern extremity of the shipyard. It trends first southeastward, then east-southeastward, and finally eastward, and through it the 20½-foot harbor channel continues to a position about 200 yards westward of Nybro. Both sides of the inner harbor are lined with quays, and on the southeastern side there are several small piers for boats.

A submarine cable crosses the channel about $\frac{1}{4}$ mile within the harbor entrance; the landing places of this cable are marked by notice boards.

Pilots for incoming vessels can be obtained from Albuen. Departing vessels can obtain pilots from Nakskov. See also section 2C-8.

Directions.—See section 2C-11.

FACILITIES.—The town of Nakskov, which had a population of 16,032 in 1965, is situated on the northern side of the harbor. The principal industries are shipbuilding grain processing, and sugar refining. Imports include manufactured goods, coal, grain, fodder, fertilizer, and lumber. Exports consist mainly of agricultural and dairy products. Nakskov is a first port of entry; the customhouse is located on the northeastern side of the inner harbor.

Mollekaj, the grain quay on the eastern side of the outer harbor, has about 630 feet of berthing space with a depth of 20 1/2 ft.

alongside. Vestrekaj, the outermost quay on the northeastern side of the inner harbor, extends about 500 feet east-southeastward from Mollekaj and has depths of 5.5 to 6.3 m (18.0 to 20.6 ft.) alongside. Toldbodkaj, which also has a depth of 20 1/2 feet alongside, extends about 800 feet southeastward from Vestrekaj. Havnegadeskaj comprises the quayage between Toldbodkaj and the northern end of Nybro; it has about 1,600 feet of berthing space with depths of 2.0 to 5.5 m (6.5 to 18.0 ft.) alongside.

Faergelandskaj, on the southwestern side of the inner harbor and opposite the middle of Havnegadeskaj, has a length of about 760 feet and a depth alongside of 20 1/2 feet; the quays northwestward of Faergelandskaj are used for shipyard purposes and for berthing small craft. Between Faergelandskaj and Nybro there is a quay which has a length of about 500 feet and a depth alongside of 5.5 m (18.0 ft.).

A traveling coal transporter is located on Faergelandskaj, and there are grain elevators on Mollekaj and Faergelandskaj. Most of the quays are served by rail. Tugs are available.

Fresh provisions are plentiful. Water is piped to the principal quays. Coal can be obtained. Diesel oil is supplied from a small petroleum storage installation at the western end of Vestrekaj.

Major hull and machinery repairs can be made at the shipyard on the southern side of the outer harbor. In this yard, the larger of two graving docks has the following dimensions: length, 626 feet; width, 90 feet; depth over the sill at HWOS, 6.7 m (21.9 ft.). A 125-ton crane and several cranes of smaller capacity are located in the shipyard. Additional repair facilities are afforded by machine shops, foundries, and engine repair shops in the town. A salvage vessel and diving equipment are available.

There is daily steamer service to Spodsbjerg, on Langeland, and regular service to København and England. Nakskov is served by the Lolland railroad system, which connects at Nykøbing (sec. 7B-9) with lines to other parts of Denmark.

A hospital is available.

Deratting.—See section 1-7.

ANCHORAGES

2C-13 East coast of Langeland.—During westerly winds vessels can anchor anywhere off the east coast of Langeland, but the strong currents and the swell which usually accompanies fresh or strong winds may render the anchorage uncomfortable.

Onsevig.—See section 2C-8.

Nakskov Fjord.—See section 2C-11.

Part D. PASSAGE BETWEEN FYN AND LÅNGELAND

2D-1 Hov (*Lille Hov*, $55^{\circ}10' N.$, $10^{\circ}57' E.$) and Hov Sand are described in section 2C-1.

Nyborg Fjord is described in sections 2B-10 and 2B-11.

GENERAL REMARKS

2D-2 The western part of Store Bælt southward of Nyborg Fjord is a passage bounded on the west by the east coasts of Fyn and Tursø (sec. 2D-6), and on the east by the northern half of the west coast of Langeland and a shallow underwater ridge extending northward from that coast to a position about 6 miles northward of Lille Hov. This ridge is about 1 mile wide and is intersected by several narrow channels; on it lie two islets, Vresen and Smørstakken.

The fairway through the passage forms the northern approach to the eastern entrance of Svendborg Sund (sec. 2D-9) and to Rudkøbing Løb (sec. 2D-13). The ports of Svendborg and Rudkøbing, with the eastern approach to the former and the northern and southern approaches to the latter, are described in this chapter part.

DEPTHS—OFF-LYING DANGERS

2D-3 From Vesterrenden (sec. 2B-2) to the southern limit (sec. 2-1) of the passage between Fyn and Langeland there are depths in the fairway of more than 5 fathoms. The fairway of Svendborg Sund has a least depth of $22\frac{1}{2}$ feet. Rudkøbing Løb has a least depth of 16 feet from its northern entrance to Rudkøbing and $12\frac{1}{2}$ feet southward of that port.

Palegrund, with a least depth of 2 fathoms, lies on the western side of the fairway and about $1\frac{1}{3}$ miles off the coast at the southern end of Kajbjerg Skov (sec. 2B-10).

Stokkebæk Flak, a rocky patch with a least depth of 2 fathoms, lies about $3\frac{2}{3}$ miles westward of Lille Hov. There are depths of over

4 fathoms between this patch and the shorebank which extends from Fyn, but the main fairway, with depths of over 6 fathoms, lies about $\frac{1}{2}$ mile eastward of Stokkebæk Flak.

Ore Flak, with depths of less than 5 fathoms, extends nearly $1\frac{1}{2}$ miles from the Fyn coast in the vicinity of Lundeborg, a fishing village with a small harbor situated about 7 miles southward of Kajbjerg Skov. A $2\frac{1}{4}$ -fathom rocky patch lies on Ore Flak about 1 mile east-southeastward of the harbor at Lundeborg; elsewhere on the flat the bottom is clay and weed. Between Stokkebæk Flak and Ore Flak the depths are very irregular.

Vresen Puller, the northernmost dangers on the ridge which extends northward from the west coast of Langeland, are a number of rocky patches with a least depth of $1\frac{1}{2}$ fathoms. These patches are separated from Dronning Mariæ Puller (sec. 2B-4) by a narrow channel in which the least depth is $4\frac{3}{4}$ fathoms. The northeastern side of Vresen Puller is marked by a conical buoy moored in a depth of $5\frac{1}{2}$ fathoms.

Vresen, the northern of the two islets on the ridge, lies with its northern extremity nearly 4 miles north-northwestward of Lille Hov. It is narrow and covered with grass, and on its northern part is a fishing hut. Vresen lies in the middle of a large shoal with depths of less than 3 fathoms. The northern part of this shoal is a flat extending to $1\frac{1}{3}$ miles northward and $1\frac{1}{4}$ miles north-northeastward from Vresen; there are depths of less than 6 feet over a rocky bottom in several places on this flat. The depths on the part of the shoal extending from the eastern side of Vresen increase regularly eastward, but the depths off the western side of the islet are very irregular. A sandspit with depths of less than 6 feet extends about $\frac{3}{4}$ mile south-southeastward from the southern end of Vresen; portions of this spit dry at low water.

A $4\frac{3}{4}$ -fathom patch and a $4\frac{1}{2}$ -fathom patch lie nearly $1\frac{1}{2}$ and $1\frac{1}{4}$ miles, respectively, north-

westward of the northern extremity of Vresen. Two 5-fathom patches lie about 1 mile west-northwestward and westward, respectively, of the southern extremity of the islet, and a $5\frac{1}{4}$ fathom patch lies nearly 2 miles southwestward of the same point.

Kobberdyb, the deepest channel intersecting the ridge, lies nearly 1 mile southward of Vresen. Southward of the sandspit extending south-southeastward from Vresen this channel has depths of not less than 3 fathoms over a breadth of about 200 yards and a depth of as much as 12 fathoms in midchannel. A $2\frac{1}{4}$ -fathom patch lies close off the western entrance of Kobberdyb, and the greatest depth here is found in a winding channel leading southward of this patch. A 7-foot rocky patch lies on the southern side of the eastern entrance of Kobberdyb, and is marked by a **buoy** moored in a depth of 3 fathoms. A **buoy** is moored in a depth of $2\frac{1}{4}$ fathoms on the northern side of the channel and close southward of the extremity of the sandspit extending south-southeastward from Vresen. A **buoy** is moored in a depth of 2 fathoms on the southern side of the middle part of the channel.

Smørstakken, a small islet composed of sand and rocks, lies on the eastern side of the ridge and about 4 miles southward of Vresen. The depths on the ridge between Kobberdyb and Smørstakken are very irregular. Some above-water rocks lie about $\frac{1}{2}$ mile northward of Smørstakken, and a spit with a depth of less than 2 feet extends about $\frac{1}{3}$ mile southward from this islet and is steep-to on its eastern side.

Rødgrund, the southernmost portion of the ridge extending northward from Langeland, is rocky and has a least depth of 4 feet. Its northern end is separated from a flat which extends nearly $\frac{1}{2}$ mile southward from Smørstakken by Smørstakke Løb, and its southern end is sepa-

rated from the shorebank on the western side of Langeland by Stoense Løb.

Smørstakke Løb has a least depth of 2 fathoms. The northern side of the eastern entrance of this channel is marked by a **light buoy** moored in a position nearly $\frac{1}{2}$ mile south-southeastward of Smørstakken; the light buoy is replaced by a spar **buoy** when ice forms. The southern side of the channel is marked by a spar **buoy**. A red and black horizontally banded **buoy** is moored on the southern side of the western approach to Smørstakke Løb in a position about 1 mile southwestward of Smørstakken.

Stoense Løb has a least depth of $1\frac{3}{4}$ fathoms and trends in a general northeasterly and southwesterly direction. The southern side of the western entrance of this channel is marked by a **buoy** moored in a position about $2\frac{1}{2}$ miles south-southwestward of Smørstakken. Both sides of the channel are marked by spar **buoys**.

Dangers fringing the coast are described with the respective sides of the passage.

CURRENTS

2D-4 The currents in the passage between Fyn and Langeland are influenced by the currents in the main part of Store Bælt and by those in Svendborg Sund and Rudkøbing Løb. The resultant currents are variable, but they usually follow the direction of the fairway, and in the smaller channels they set across the shoals. The currents eastward and westward of Vresen often set in opposite directions. See also section 2-5.

ICE

2D-5 See section 2-7.

WESTERN SIDE OF THE PASSAGE BETWEEN FYN AND LANGELAND

2D-6 The eastern side of Fyn from Kajbjerg Skov to the entrance of Skaarupøre Sund, about $12\frac{1}{2}$ miles south-southwestward, is relatively high inland and slopes gradually to the

coast. In several places there are large woods, and these together with the hedges which enclose many of the fields give the entire countryside a wooded appearance. This stretch has no indentations of navigational importance.

The coast between Kajbjerg Skov and Lunde-borg trends first south-southeastward for nearly 2 miles to Kloverhage Pynt, a low, rounded projection with a low bluff behind it, and then trends in a general southerly direction for about 5 1/2 miles to the harbor at Lunde-borg.

Prominent objects along this part of the coast are Taarup Church, which is red with a slender spire and is located about 1 1/4 miles southward of Helvedbakke (sec. 2B-10); Svindinge Church, which is white with a tall dark spire and is located about 3 1/4 miles west-southwestward of Taarup Church; Klintholm storehouse, a red-roofed white building standing about 2 1/2 miles southward of Kloverhage Pynt; and the village and harbor of Lunde-borg, about 3 miles south-southwestward of Klintholm storehouse. Several village churches in addition to those mentioned above are visible only from certain directions.

The shorebank extending from the coast between Kajbjerg Skov and Lunde-borg to the 3-fathom curve is composed mainly of sand and small stones; there are rocks near the shore in some places. Off the southern end of Kajbjerg Skov the shorebank has a width of nearly 3/4 mile, but elsewhere along this stretch its width varies from about 200 yards to 1/2 mile.

KOBBERDYB BEACON is located about 1 1/2 miles southward of Kloverhage Pynt. It consists of a white triangle with its central part open, and when seen in range with Svindinge Church it appears as a black triangle inside a white one.

LUNDEBORG (55°08' N., 10°47' E.) has a small harbor formed by two curved breakwaters. The entrance, which faces southward, is about 30 feet wide. There is a ferry berth on the outer side of the northern breakwater.

The depth in the entrance and throughout the harbor is 9 1/2 feet. Northerly and north-westerly winds may raise the water level 2 feet, and easterly winds may lower it the same amount. A light is shown occasionally on the head of the northern breakwater.

From Lunde-borg to Skaarupore Sund the coast first trends southward for about 2 1/4 miles to Elsehoved, a low point terminating in a small bluff about 23 feet high, then forms a small bay between this point and Aspelunds Hoved, about 2 1/4 miles south-southwestward, and finally trends west-southwestward for about 1 1/2 miles to the northern entrance point of Skaarupore Sund. Tiselholt Manor, a large red building with a small spire, is located about 3/4 mile west-southwestward of Elsehoved and is very conspicuous from southward.

The portion of Ore Flak (sec. 2D-3) within the 3-fathom curve projects slightly more than 1/2 mile from the coast immediately southward of the harbor at Lunde-borg. Between this projection and the entrance of Skaarupore Sund the width of the shorebank is less than 1/2 mile. Scattered rocks lie close inshore, and reefs extend about 200 yards from Elsehoved and nearly 1/4 mile from the coast about 1 1/4 miles southwestward of that point.

ELSEHOVED LIGHT is shown on the extremity of Elsehoved.

SKAARUPORE SUND, between Fyn and Turo, is a shallow passage about 2 miles long. It connects Store Baelt with Svendborg Sund, but is navigable only by small craft. A submarine power cable is laid across the eastern entrance of Skaarupore Sund; its direction is indicated by range beacons on Turo. A pipeline is laid across Skaarupore Sund to Turo.

TURO is a low island lying about 1/4 to 1/2 mile southward of the southeastern part of Fyn. It is considerably built over, especially in its northern part. Its eastern and southern sides are partially wooded. Turo village is located in the northwestern part of

the island. Features of the western side of Turo are described with the eastern part of Svendborg Sund in sections 2D-9 and 2D-10.

TURO REV, which has depths of less than 3 fathoms over a bottom of sand, rocks, and gravel, extends about 3/4 mile southeastward from the southeastern point of Turo. Close southeastward of the extremity of Turo Rev there are depths of 5 1/2 to 6 1/2 fathoms. A light buoy is moored off Turo Rev a little over 1 mile southeastward of the southeast end of Turo; it lies in the approach channel leading to Svendborg Sund. The light buoy is replaced during the winter by a spar buoy.

WEST COAST OF LANGELAND FROM HOV TO NAESHÖVED

2D-7 The western side of Langeland between the northern extremity of the island and Naeshoved, about 12 1/2 miles south-southwestward is mostly hilly. Extensive woods in several places and hedges enclosing the fields between the woods give the land a generally wooded appearance similar to that of the Fyn coast opposite. Pointed hills, some of which have wooded summits, are characteristic of Langeland. Naeshoved, about 33 feet high, terminates in a small cliff.

Conspicuous objects on this part of Langeland are Stoense Church, Snode Church, Tranekaer Castle, and Tranekaer Church, all of which are visible from the fairways on both sides of the island and are described in section 2C-6. A tileworks chimney standing on the coast about 1 3/4 miles southwestward of Snode Church is also conspicuous from the passage westward of Langeland.

There are small artificial harbors at Lohals, about 1 3/4 miles southwestward of Frankeklint (sec. 2C-1), and at Dagelokke, about 4 1/2 miles south-southwestward of Lohals.

The shorebank within the 3-fathom curve extends up to 1/3 mile from the coast between Frankeklint and a point close northward of the harbor at Lohals; it is steep-to. Lohals Hage, the southwestern end of this portion of the shorebank, is marked on its western side by a light buoy moored close northward;

it is replaced by a spar buoy when ice forms. From Lohals to Stoense Lob (sec. 2D-3) the shorebank is narrow.

For about 6 1/2 miles southward of Stoense Lob the shorebank extends up to about 2/3 mile from the coast. It is very irregular and has shallow, rocky portions alternating with relatively deep areas. There are depths of less than 5 fathoms nearly 1 mile off the coast. The shorebank projects about 1/2 mile northwestward from a point lying nearly 2 miles northeastward of Naeshoved, and it projects about the same distance northeastward from the latter point. Between these projections the shorebank is narrow, but there are patches with depths of 2 3/4 to 4 3/4 fathoms lying up to 3/4 mile offshore.

LOHALS.—The harbor of Lohals is protected on its northern and western sides by a breakwater which extends from the shore and trends successively westward, southwestward, and southward. The southern side of the harbor is formed by a mole which extends westward from the shore. A berth for the Lohals-Korsør vehicular ferry is located on the southern side of the mole. The harbor entrance is about 35 feet wide and has a depth of 12 feet. There are depths of 7 to 12 feet in the harbor. Northeasterly winds may lower the water level about 2 feet. Unlicensed pilots are available. Provisions and water can be obtained. Small repairs can be made.

LOHALS LIGHT is shown on the inner part of the mole. A light is shown on the head of the breakwater.

DAGELOKKE (Dagelykke) HAVN (55° 04' N., 10° 52' E.) is formed by two breakwaters extending in a westerly direction from the shore. The harbor is entered between the head of the northern breakwater and the head of a short mole extending north-northeastward from the middle of the southern breakwater. There is a depth of 9 feet in the entrance channel and in the greater part of the harbor. Northeasterly winds may raise the water level 4 feet, and southeasterly and southerly winds may lower it the same amount.

Two range lights are shown from 15 August to 14 April on the head of the short mole and at the head of the harbor, respectively. These lights in range 118° lead across the shorebank to the harbor entrance. Two spar buoys are moored about $\frac{1}{2}$ mile west-northwestward of Dageløkke Havn to mark the sides of the approach channel across the outer part of the shorebank. The southern side of the entrance is marked by a spar buoy.

DIRECTIONS

2D-8 Vesterrenden to Turø Rev.—A vessel from northward, having attained a position about 1 mile eastward of Knudshoved as directed in section 2B-13, should steer to pass about midway between Palegrund and Vresen Puller and thence between Stokkebæk Flak and the shoals around Smørstakken. A deep-draft vessel should take care to avoid the $4\frac{1}{2}$ - to $5\frac{1}{4}$ -fathom patches which lie northwestward, westward, and southwestward of Vresen and are described in section 2D-3. From a position about $2\frac{1}{4}$ miles westward of Lohals Light a south-southwesterly course can be steered for a position about $1\frac{1}{4}$ miles southeastward of the southeastern extremity of Turø, passing about $\frac{3}{4}$ mile east-southeastward of the shoalest part of Ore Flak.

As night a southbound vessel, having passed Knudshoved, should gradually enter the southern white sector of Knudshoved Light, taking care to pass clear of Knudshoved Flak. This sector leads clear of Palegrund, but the $4\frac{3}{4}$ - and $5\frac{1}{4}$ -fathom patches westward and south-westward of Vresen lie within its limits. As the eastern part of Stokkebæk Flak lies in the western half of this sector, a vessel should keep in the eastern half until the white sector of Elsehoved Light is entered. The western limit

of the white sector of Elsehoved Light leads close eastward of Turø Rev.

Channel between Dronning Maries Puller and Vresen Puller.—A gap in Juelsberg Skov, which lies a short distance north-northwestward of Nyborg, in range 310° with Knudshoved Light lead through the narrow channel between Dronning Maries Puller and Vresen Puller in a least depth of $4\frac{3}{4}$ fathoms, passing northeastward of the buoy marking the northeastern side of Vresen Puller.

Kobberdyb can be passed through in a least depth of 14 feet by keeping Svindinge Church in range 280° with Kobberdyb Beacon. This range leads over the $2\frac{1}{4}$ -fathom patch which lies close off the western entrance of the channel. The deeper channel southward of this patch can be used only by small vessels with local knowledge.

Smørstakke Løb and **Stoense Løb** should not be attempted without local knowledge.

EASTERN APPROACH TO SVENDBORG

2D-9 The port of Svendborg, situated on the south coast of Fyn about $4\frac{1}{2}$ miles westward of Aspelunds Hoved, is approached from Store Bælt through the fairway southward of Turø and the eastern part of Svendborg Sund, the narrow passage separating Taasinge on the one side from Fyn and Turø on the other.

Taasinge is the largest island on the southern side of the main fairway southward of Fyn. It is considerably built over and has a number of wooded areas, especially on its eastern side. Its greatest elevation is a 242-foot hill located about 2 miles south-southwestward of Øerne, the northern extremity of the island. On the summit of this hill stand Bregninge Church, surmounted by a spire, and Bregninge Mill, both of which are prominent landmarks. Valdemarsslot, a castle situated on the coast about $1\frac{1}{2}$ miles eastward of Bregninge Church,

comprises a number of buildings, the principal structure having a dark blue roof. A hill 88 feet high is located about $\frac{3}{4}$ mile southward of Bregninge Church, and about $\frac{1}{3}$ mile westward of this hill is Bjerreby Church.

The coast of Taasinge east-northeastward of Bjerreby Mill forms the peninsula of Vemmenaes, which extends first eastward and then northward, and which is the easternmost part of the island. Lunkebugt lies between the outer part of Vemmenaes and the coast westward. The eastern and southern sides of Vemmenaes are described in sections 2D-13 and 2D-14.

Features of the northwestern, western, and southern sides of Taasinge are described in chapter 3.

The fairway southward of Turo is entered from eastward between Turo Rev and a reef which extends nearly $\frac{1}{4}$ mile northeastward from Stenodde, the northeastern extremity of Vemmenaes. The outer end of the latter reef is marked by a spar buoy moored in a depth of $3\frac{1}{2}$ fathoms.

A pair of lighted range beacons stand about $\frac{1}{4}$ mile northward of Valdemarsslot and in range 283° lead southward of Turo Rev and into the eastern entrance of Svendborg Sund.

Eastern part of Svendborg Sund.—That part of Svendborg Sund which lies between its eastern entrance and the harbor of Svendborg is described herein. The western part of the sound is described in section 3E-9.

Information concerning water level, currents, and ice are given in section 3E-3 and 3E-4.

In addition to the landmarks in the vicinity of Svendborg Sund which have been described previously there are three churches and Kristiansmølle. Between the harbor of Svendborg and Kristiansminde the northern side

of the sound is wooded and slopes steeply to the shore.

The eastern part of Svendborg Sund can be traversed by vessels with a draft of $21\frac{1}{4}$ feet; however, this can be done only by day and with the aid of a pilot.

The eastern entrance of the channel through the sound lies between Grønneodde, a tongue of the shorebank extending nearly 800 yards southward from the southwestern extremity of Turo on the one hand, and Middelgrund and Slotshage on the other. Slotshage extends nearly $\frac{1}{2}$ mile east-southeastward from a point close northeastward of Valdemarsslot. Middelgrund consists of two patches, the northern, with a least depth of 2 fathoms, lying about $\frac{1}{2}$ mile eastward of Valdemarsslot, and the southern, with a least depth of $1\frac{3}{4}$ fathoms, lying about $\frac{2}{3}$ mile eastward of the castle. The southern patch is separated from Slotshage by a narrow channel with a least depth of $2\frac{1}{2}$ fathoms.

Two spar buoys are moored off the northeastern side of the southern patch of Middelgrund, and off the northern side of northern patch of Middelgrund, respectively. The northeastern side of Slotshage is marked by a spar buoy. A spar buoy marks the southwestern extremity of Grønneodde.

From the eastern entrance of Svendborg Sund to the harbor of Svendborg the winding channel is bordered by shallow and mostly steep-to shorebanks which vary considerably in width. Turo Bund, a long, narrow inlet, indents the western side of Turo between a point lying about $\frac{1}{2}$ mile northward of the southwestern extremity of the island and Maarodde, nearly $\frac{2}{3}$ mile westward. Middelgrund, with a least depth of 9 feet, lies in the middle of the sound westward of Maarodde; the main channel passes northeastward of this shoal, but between the shoal and the shorebank extending from Taasinge there is a narrow winding channel with a least depth of $16\frac{1}{2}$ feet. After round-

ing Maarodde the fairway trends northward to a position close southward of Kristiansminde, and thence it turns westward to the harbor of Svendborg.

A submarine cable crosses Svendborg Sund about $\frac{1}{3}$ mile northward of Maarodde.

The several reaches of the fairway from Grønneodde to Svendborg are indicated by pairs of **lighted range beacons** located respectively about $\frac{1}{3}$ mile east-northeastward of Maarodde; on the western side of Grasten, the southwestern part of Turø; near Kristiansminde (two ranges); and on the northwestern side of Turø. Spar **buoys**, a few of which are fitted with reflectors, are moored on both sides of the fairway. The direction of the fairway for buoyage purposes is from the eastern entrance toward Svendborg.

2D-10 Piers.—Grasten Pier, close northward of the southwestern extremity of Turø, has a depth of 3.0 m (9.8 ft.) at its head.

A pier with a depth of 20 $\frac{1}{2}$ feet at its head is located at Troense, a village on Taasinge about $\frac{1}{3}$ mile southwestward of Maarodde. The water level at this pier may be lowered about 3 feet by westerly gales.

Vindebyore Pier, which extends about 300 feet northward from Ørerne, has a depth of 3.0 m (9.8 ft.) at its head.

A pier with a depth of 3.5 m (11.4 ft.) at its head extends about 300 feet southward from the shore at Kristiansminde. Gales from north to northeast may raise the water level about 5 feet, and gales from south to southwest may lower it the same amount. The current sets strongly past the pier. A light is shown on the head of the pier.

Anchorage.—There is good anchorage in the fairway between Turø and Vemmenæs in 4 to 6 fathoms, soft bottom. Vessels can anchor off Troense. Turø Bund is used as a winter anchorage by small local vessels, and there is anchorage for small vessels on the shorebank northward of Ørerne and northward of the alinement of the lighted range beacons located about $\frac{1}{4}$ mile northward of Valdemarsslot.

Pilots can be obtained from Troense and Svendborg. See also section 1-37.

Directions.—Bregninge Church in range about 273° with Valdemarsslot leads southward of Turø Rev in a least depth of $4\frac{3}{4}$ fathoms. Having passed Turø Rev, a vessel should steer for the entrance of Svendborg Sund between Middelgrund and Grønneode with the lighted beacons standing northward of Valdemarsslot in range 283° . When a mill located about $\frac{3}{4}$ mile east-northeastward of Maarodde bears 009° and is open westward of the western side of Grasten, the vessel should alter course northward and proceed through the fairway with the guidance of the lighted range beacons and the buoys.

As the ranges lead across or close to the shorebank in some places and several of the buoys are moored in depths of less than 3 fathoms, it is advisable for a vessel to employ a pilot, especially when navigating the channel at night.

SVENDBORG

Position: $55^{\circ}04'N.$, $10^{\circ}37'E.$

Depths: Approaches, 21 $\frac{1}{4}$ -foot draft.
Ostre Havn, 5.6 to 7.5 m (18.3 to 24.6 ft.).
Nordre Havn, 4.3 to 6.5 m (14.1 to 21.3 ft.).
Søndre Havn, 4.0 to 6.2 m (13.1 to 20.3 ft.).
Berths, 3.1 to 7.0 m (10.1 to 22.9 ft.).

Tidal range: 1 to 2 feet.

Port plan: See section 2D-12.

2D-11 Svendborg, the southernmost port of Fyn, is situated near the middle of Svendborg Sund. It is important as a southern terminus of railroads and highways on Fyn, and as a terminal for a train ferry service to Langeland and automobile ferry services to Ærø and Taasinge. The port has importance also as a commercial center for the export of agri-

cultural products. The harbor of Svendborg is a triangular indentation on the northern side of Svendborg Sund and comprises three principal basins as well as several minor basins and quays.

TIDES AND WATER LEVEL.—The range of tide at Svendborg varies from 1 to 2 feet. Gales between north and northeast may raise the water level as much as 5 feet, and those between south and southwest may lower it an equivalent amount.

The current in Svendborg Sund is very irregular and greatly influenced by the wind. A northwesterly gale normally causes a west-going current and an easterly gale, an east-going current; in each case the current may attain a rate of 6 knots in the narrowest part of the sound.

ICE.—See table 5 in chapter 1 for ice information. The port is usually kept open by ice-breakers.

HARBOR.—The central part of the harbor is occupied by Frederikso, an island which is connected with the western side of the harbor by a fixed bridge; the passage under this bridge is available only for boats. The greater part of Frederikso is occupied by two shipyards. An oil depot is located near the eastern extremity of the island, and north-westward of the oil depot is a coal storage area.

Ostre Havn, the deepest basin of the harbor, lies on the northeastern side of Frederikso. Except for an 18-foot patch at its northwestern end, it has depths ranging from 22 1/2 feet to 25 feet. Frihavn, a small basin with depths of 10 to 15 feet, indents the northeastern side of Ostre Havn just within the entrance.

Nordre Havn, the inner part of the harbor, is entered between the northern extremity of Frederikso and a triangular mole projecting from the northeastern side of the harbor. This basin is used mainly by small coasting vessels and fishing craft. It has depths of 14 to 21 feet except in a small-craft mooring area at the head of the harbor, where there are depths of 11 to 14 feet. Several mooring dolphins are located in the central part of Nordre Havn.

Sondre Havn lies on the western side of Frederikso and southward of the bridge. It is used mostly as a ferry terminal and for ship-

yard purposes. There are three ferry slips in the basin, and another slip is located immediately westward of the basin entrance. The depths in the basin range from 13 to 22 feet.

Between the southernmost ferry slip and Gasvaerkskajen, about 250 yards southward, the shore is quayed for small craft. A circular yacht basin formed by two breakwaters lies nearly 1/4 mile south-southwestward of Gasvaerkskajen and has a depth of 9 1/2 feet. Close eastward of this basin is a berth for a ferry to Vindeby, on Taasinge.

A light is shown on the eastern extremity of Frederikso, and a light is also shown on the southern extremity of that island. A light is shown on the western side of the entrance of Sondre Havn.

SUBMARINE POWER CABLES are laid across Svendborg Sund between the ferry berth close eastward of the yacht basin at Svendborg and the berth at Vindeby. The direction of these cables are indicated by range beacons at Vindeby.

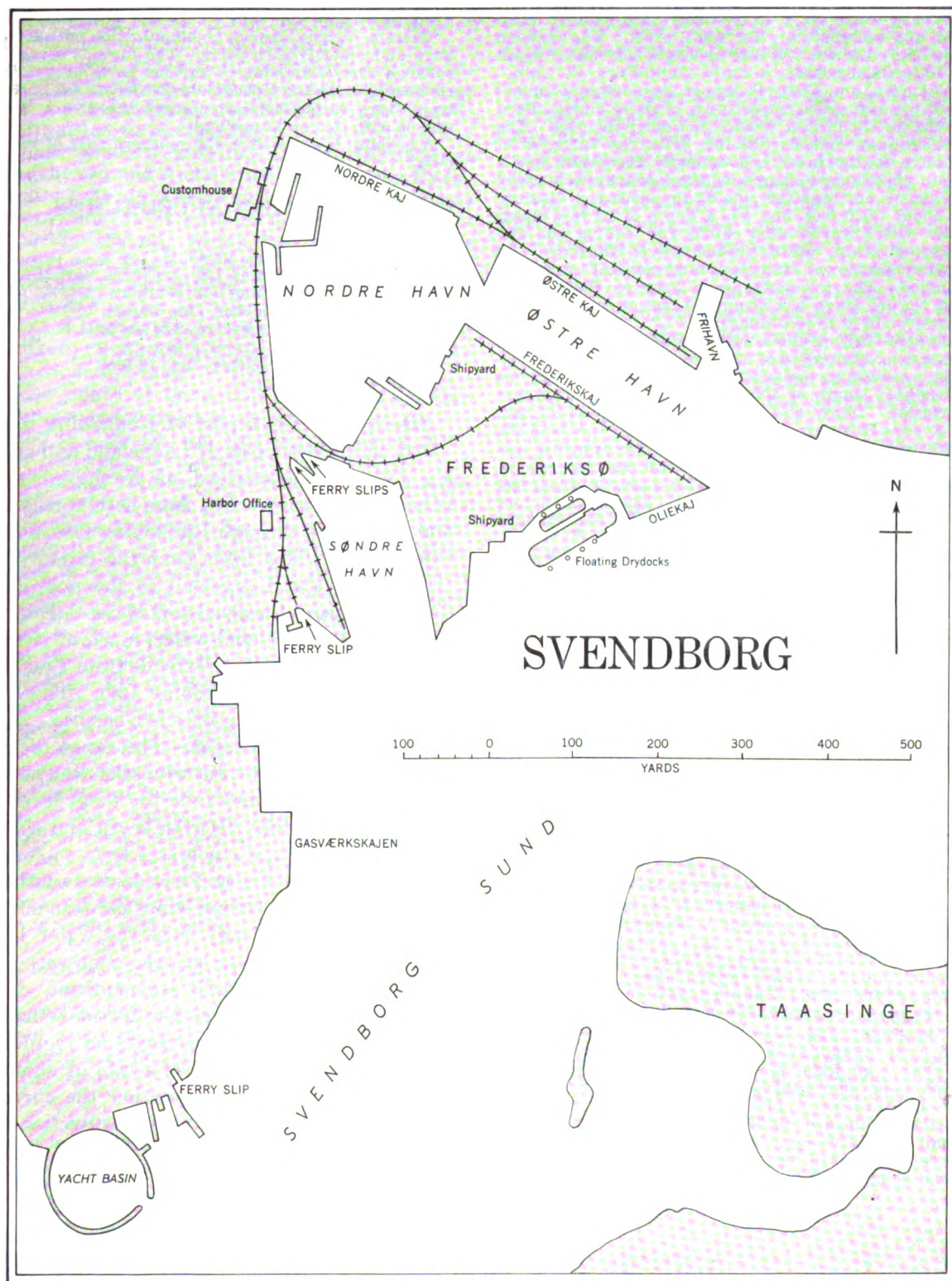
Several submarine communication cables cross the sound a short distance eastward of the above-mentioned cables. Their direction is indicated by range beacons on the Fyn shore.

PILOTS can be obtained at Svendborg, and from Troense (sec. 2d-10) if approaching from eastward, or from Tankefuld (sec. 3E-9) if approaching from westward. See also section 1-37.

Pilots for Faaborg must be obtained at Svendborg (see sec. 3E-7).

DIRECTIONS.—See sections 2D-10 and 3E-9.

2D-12 FACILITIES.—The town of Svendborg spreads over an area of low or undulating ground around the harbor and is backed by hills rising to heights of over 100 feet. It is the most important town on the southern side of Fyn. The principal industries are shipbuilding, the manufacture of light machinery and electrical goods, the preparation and packing of agricultural products, flour milling, and brewing. The chief imports are grain, feedstuffs, coal, coke, iron, timber, and fertilizers. Exports consist mainly of agricultural products. Svendborg is a first port of entry. The customhouse is located on the western side of Nordre Havn.



The quayage from the northeastern side of the entrance of Østre Havn to the head of Frihavn is irregular and suitable only for small craft. The western side of Frihavn is 240 feet in length and has a depth of 10 feet alongside.

Østre Kaj and Frederikskaj, on the northeastern and southwestern sides, respectively, of Østre Havn, afford berths for the largest vessels that enter the port. The former quay extends 815 feet from the entrance of Frihavn to the inner end of Østre Havn and has a depth of 22½ feet alongside; the latter extends along the entire northeastern side of Frederiksf, a distance of about 1,000 feet, and has a depth of 23 feet alongside. Østre Kaj is used chiefly for loading and discharging grain, grain products, and fertilizer. At Frederikskaj, coal, fertilizer, and general cargo are handled. The triangular mole between Østre Havn and Nordre Havn has about 400 feet of quayage with depths of 16 to 18 feet alongside.

Nordre Kaj, on the northern side of Nordre Havn, has a length of 660 feet and a depth of 17 feet alongside. A quay on the western side of Nordre Havn has a berthing length of 400 feet with a depth of 14 feet alongside. Quays and piers in the northwestern part of Nordre Havn are for the use of small craft, and the southeastern side of this basin is for shipyard use.

Oliekaj, at the eastern end of the southern side of Frederiksf, is a tanker berth with a length of 260 feet and a depth alongside of 23 feet. The remainder of the southern side of Frederiksf is used for shipyard facilities.

On the eastern side of Søndre Havn there is a shipyard quay with a berthing length of 480 feet and a depth of 13 feet alongside. A quay on the western side of Søndre Havn has a berthing length of 430 feet and a depth of 20 feet alongside; northward of this quay the basin is used only by ferries.

Gasværkskajen has a berthing length of 200 feet with a depth of 15½ feet alongside.

A 2-ton traveling bridge transporter for discharging coal is located on Frederikskaj. A 2½-ton hand crane stands near the northern end of the western side of Nordre Havn. There is a 6-ton mobile crane in the port. On Østre Kaj are two grain elevators with capacities of 60 to 80 tons per hour, and on the Frihavn quays are three smaller grain elevators. Most of the quays are served by rail. No tugs are available, but if towing is necessary it can usually be done by local steamers and motor launches.

Provisions are plentiful, and water is piped to the quays. Coal can be obtained at Frederikskaj, and a small amount of fuel oil can be supplied at Oliekaj.

The southern of the two shipyards on Frederiksf engages in the construction of small oceangoing vessels. Repairs to hulls, boilers, and machinery can be undertaken at this yard. There are two floating drydocks on the southern side of Frederiksf. The dimensions of the larger dock are as follows: maximum length, 375 feet; breadth at entrance, 63 feet; depth on sill at mean high water springs, 18.5 feet; lifting power 3,500 tons. The most powerful of several cranes in the shipyard has a lifting capacity of 40 tons. The northern shipyard on Frederiksf builds and repairs small wooden vessels. The larger of two marine railways at this yard has a lifting power of 350 tons. A small shipyard with a marine railway and a machine

shop is located nearly 1 mile east-southeastward of Frederiksf.

There is regular steamer communication with København and other Danish ports. The town is served by railroad lines extending to various parts of Fyn and connecting with the København-Esbjerg main line. A train ferry to Rudkøbing connects the Fyn railroad system with that on Langeland.

A hospital is situated in the southern part of Svendborg.

RUDKØBING AND APPROACHES

Position:	54°56' N., 10°43' E.
Depths:	Rudkøbing Løb, northern part, 16½ feet. Rudkøbing Løb, southern part, 11½ feet. Main harbor, 11 to 16 feet. Fishing harbor, 8 to 10 feet. Yacht harbor, 7 feet. Ferry harbor, 13 to 16 feet.
Tidal range:	Negligible.

2D-13 The small port of Rudkøbing is situated on the west coast of Langeland and about 3¼ miles southwestward of Næshoved (sec. 2D-7). It is approached from both northward and southward through Rudkøbing Løb, a narrow channel which leads from the fairway between Turø and Langeland to the pool (sec. 3E-13) between the shoals off Marstal, Strynø, and Langeland. Shoal water, much of it with depths of less than 6 feet, extends from Taasinge and Langeland to Rudkøbing Løb. The harbor of Rudkøbing comprises five basins.

Tides and water level.—The range of tide at Rudkøbing is slight, but winds between northwest and northeast may raise the water level up to 2 feet, and winds between south and southwest may lower it as much as 4 feet.

At Vemmenæs Ferry Pier, on the southern side of Vemmenæs, strong winds between northwest and northeast may raise the water level about 2 feet, and those between southeast and southwest may lower it the same amount.

Currents.—In calm weather the tidal current in Rudkøbing Løb changes direction regularly about every 6 hours and has a rate of about 2 knots. During unsettled weather the current in the channel may set in the same direction for several days and may attain a rate of 4 to 5 knots. Northwesterly winds cause a south-

going current and northeasterly winds a north-going current. The currents set across the harbor entrances at Rudkobing.

ICE.—See table 5 in chapter 1 for ice information. Ice conditions between Taasinge and Langeland may at times present serious difficulties to navigation.

The western side of Langeland between Naeshoved and Rudkobing rises gradually inland; it is considerably built over and has many hedges. Prominent landmarks are Tullebolle Church, which has a low, square tower and stands about 1 3/4 miles southeastward of Naeshoved; Simmerbolle Church, which has a similar tower and is located about 1 2/3 miles west-southwestward of Tullebolle Church; Rudkobing Church, a red building with a tall, dark spire.

The coast of Langeland southward of Rudkobing is described in section 3D-14.

SIO is a small, low island lying about midway between Vemmenaes (sec. 2D-9) and Rudkobing. There is a farm in the middle of the island, and some houses stand on the southeastern point. Sio is separated from Vemmenaes by Sio Sund, which has depths of 1.2 to 4.7 m (3.9 to 15.4 ft.) in mid-channel. A fixed highway bridge crosses Sio Sund from the western extremity of Sio northwestward to the southeastern coast of Taasinge. Sio Pier, 650 feet long and disused, is located on the eastern side of Sio.

RUDKOBING LOB.—From its northern entrance, which is nearly 2 miles westward of Naeshoved, Rudkobing Lob leads in a general southerly direction for about 2 1/2 miles to the harbor of Rudkobing, passing eastward of Sio. It then continues southward for nearly 2 1/2 miles to its southern entrance between Stryno (sec. 3E-13) and Langeland. The sides of the channel are fairly steep-to. The shoal areas on either side consist mainly of sand overgrown with weed, but in some places there is rock.

BRIDGE.—A fixed bridge spans Rudkobing Lob between the southeastern extremity of Sio and Rudkobing harbor. The lighted, navigable span is 262 feet wide with a vertical clearance of 85 feet. A fog signal is sounded on the span.

The channel has been improved by dredging so as to afford a least depth of 16 1/2 feet from the northern entrance to the main harbor of Rudkobing and a least depth of 11 1/2 feet from that harbor to the southern entrance. As the dredged portions do not follow the bends of the natural channel, there are two channels in places. The dredged sections have a bottom width of about 100 feet.

On the western side of the northern approach of Rudkobing Lob, the shorebank extending from the eastern side of Vemmenaes to the 3-fathom curve has a width of about 1/4 to 1/2 mile. The reef marked by a spar buoy moored northeastward of Stenodde (sec. 2D-9) lies at the northern end of this portion of the shorebank. Naversgrund, a shallow flat, extends about 2/3 mile east-southeastward from Faergeodde, the southeastern extremity of Vemmenaes.

The northern entrance reach of Rudkobing Lob passes between Naversgrund and Middelgrund, which extends about 1 1/4 miles from the Langeland coast. This reach is indicated by a pair of lights with triangular daymarks in range 206° on the northeastern part of Sio. A tide gage is located on Middelgrund in a position about 1 mile east-northeastward of Faergeodde.

A pair of range lights on the northern side of the town of Rudkobing and two pairs at the main harbor lead through the dredged reaches of the channel from the entrance range to the harbor entrance. Two pairs of range lights, located respectively on the western side of the harbor and the eastern side of Sio, lead through the southern part of Rudkobing Lob. There are daymarks at the positions of all these lights except the pair which form the southernmost range leading to the main harbor entrance from northward.

Two lights are shown respectively on the northeastern side of the main harbor entrance and the southwestern side of the fishing harbor entrance at Rudkobing.

A conical fairway buoy is moored in a depth of 4 fathoms about 1 1/3 miles northeastward of Faergeodde. Both the natural and the dredged channels are marked by buoys in accordance with the Danish uniform system.

Lighted buoys are in service during winter months only. The direction of the channel for buoyage purposes is from north to south.

2D-14 Submarine cables.—Several submarine cables are laid from the southeastern end of Siø to the Langeland coast within about $\frac{1}{2}$ mile northeastward of the harbor at Rudkøbing. Beacons, one pair of which is lighted, on Siø mark the limits of the cable area, and beacons on Langeland, two pairs of which are lighted, indicate the directions of the cables.

A submarine cable is laid across the southern part of Rudkøbing Løb between a position about $\frac{3}{4}$ mile south-southwestward of the harbor and the eastern side of Strynø; its direction is indicated by beacons at both landing places.

Several submarine cables are laid in a west-northwesterly direction from the western end of Siø to the southeastern side of Taasinge. Beacons mark the landing places of the cables on both coasts.

Harbor.—The harbor of Rudkøbing fronts the town and consists of four parts, each of which has a separate entrance. The main harbor lies northwestward of Rudkøbing Church. It communicates directly with Rudkøbing Løb through an entrance about 60 feet wide between the heads of two moles. A mole projecting northwestward divides the main harbor into

two basins. The northeastern basin has depths of 4.8 to 5.0 m (15.7 to 16.4 ft.), and the southwestern basin has depths of 5.0 m (16.4 ft.) in its outer part and 3.5 to 5.0 m (11.4 to 16.4 ft.) in its inner part.

A fishing harbor with depths of 8 to 10 feet lies immediately northeastward of the main harbor. It is approached from Rudkøbing Løb by a channel having a least depth of 3.0 m (9.8 ft.). A short distance northeastward of the fishing harbor is a yacht harbor which is protected by breakwaters and has a depth of 2.2 m (7.2 ft.). Three spar buoys mark the approach to this basin.

There is a ferry harbor, with depths of 4.0 to 4.5 m (13.1 to 14.7 ft.), immediately southwestward of the main harbor. It is open to Rudkøbing Løb and is protected on its western side by a mole. At the head of this basin is a train ferry slip, and on the eastern side is a quay used for berthing passenger and mail vessels.

Anchorage.—Vessels can anchor between Turø and Vemmenæs. See section 2D-10.

Pilots are stationed at Rudkøbing. They will take vessels through Rudkøbing Løb and to Marstal (sec. 3E-12) and the eastern entrance of Svendborg Sund. Pilotage is not compulsory, but vessels are advised to employ pilots.

Directions.—A vessel which is bound for Rudkøbing from northward and has cleared Turø Rev (sec. 2D-6) should approach the entrance of Rudkøbing Løb by keeping the lights

on the northeastern part of Sio in range 206°. After passing close eastward of the approach buoy off the entrance, the vessel should enter the channel and proceed through it with the aid of the buoys and ranges, using the dredged sections where available. The buoys marking the sides of the dredged channels are moored just outside the fairway and should not be approached closely.

A vessel proceeding through the southern part of Rudkobing Lob should be guided by the buoys and ranges.

FACILITIES.—Rudkobing, the principal town on Langeland, has a population of about 4,500. The chief industries are the manufacture of machinery and dry goods, meat canning, and the construction of small wooden vessels. The customhouse and the harbor office are located close southeastward of the main harbor.

The total length of harbor quayage is about 4,800 feet, of which about 2,300 feet has a depth of 16 feet alongside. The longest berth with this depth is on the southeastern side of the central mole in the main harbor and is about 325 feet in length. The quay on the eastern side of the ferry harbor has a length of about 390 feet, with depths of 16 feet alongside the outer 230 feet and 13 feet alongside the remainder.

Some of the quays are served by rail. There is a 6-ton crane and a coal transporter in the main harbor. A tug is available.

Provisions, coal, and some petroleum products can be obtained. Water is piped to the

quays. There is a small shipyard for building wooden vessels and a marine railway with a lifting power of 250 tons. No facilities for the repair of steel vessels are available.

Regular ferry and steamer service is maintained with Svendborg and Marstal, and a ferry runs to Vemmenæs. Rudkobing is connected by railroad with Bagenkop, near the southern end of Langeland, and a branch line extends to Spodsbjerg, on the east coast of the island.

ANCHORAGES

2D-15 BETWEEN FYN AND LANGE-
LAND.—Vessels can anchor anywhere in the fairway between Fyn and Langeland, as the holding ground is good. Westward of Vresen the bottom consists of mud in the deeper part of the channel, but it becomes sandy near the shorebank. Southward of Smorstakken there is mud, ooze, and weed in the fairway, and with weed, gravel, and stones on the shorebank. During westerly winds the best anchorage is under the Fyn coast, where vessels can anchor on or near the shorebank according to their draft. With easterly winds there is good anchorage off Lohals, where small vessels can anchor near the harbor in depths of 5 to 6 fathoms.

BETWEEN TURO AND VEMMENAES.—See section 2D-10.

EASTERN PART OF SVENDBORG SUND.—See section 2D-10.

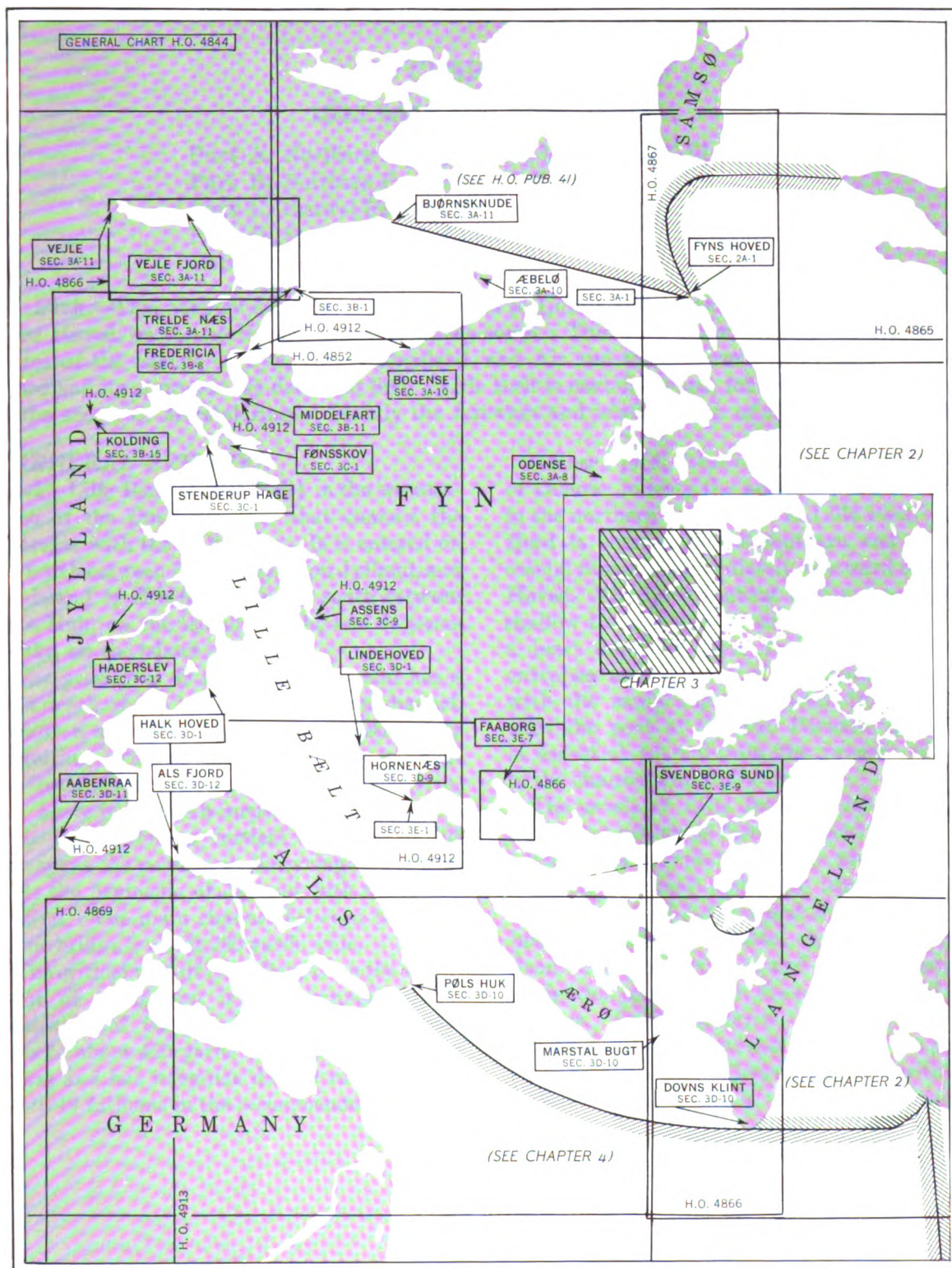


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
 Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 3—GRAPHIC INDEX

CHAPTER 3

LILLE BÆLT AND APPROACHES

Part A. Northern Approach and Entrance to Lille Bælt

Part B. Northern Part of Lille Bælt

Part C. Central Part of Lille Bælt

Part D. Southern Part of Lille Bælt

Part E. Fairways South of Fyn

Plan.—This chapter describes the approaches to Lille Bælt and the passage proper between Fyns Hoved, on the north, and Gulstav, on the south. This description includes the contiguous shores of the islands of Fyn, Ærø, Langeland, and Als and the peninsula of Jylland. Odense Fjord and its approach are described first. Lille Bælt is next described, followed by a description of the shores of Marstal Bugt. Finally the fairways and islands south of Fyn are described.

GENERAL REMARKS

3-1 Lille Bælt (Little Belt) is the westernmost of the three passages that connect the Kattegat with the Baltic Sea. It is entered on the north between Bjørnsknude, on Jylland, and the island of Æbelø and on the south between Pøls Huk, on the island of Als, and Vejsnæs Nakke, on the island of Ærø.

The passage is 68 miles in length and has a least depth of $6\frac{1}{2}$ fathoms in the main channel. However, a greater depth can be negotiated by exercising prudent navigation. The passage has its least width, about 650 yards, in Snævringen where it follows a serpentine course. Lille Bælt Bridge with a vertical clearance of 108 feet spans the passage in Snævringen and connects the peninsula of Jylland with the island of Fyn. The main channel between the piers of the bridge is about 230 yards wide.

The critical part of Lille Bælt from the standpoint of navigation is the channel passing southward of Baagø. Here the channel narrows to about 400 yards between the 6-fathom curves and has irregular depths varying from $6\frac{1}{2}$ to 19 fathoms in the recommended fairway.

Odense Fjord, at the head of which is the port of Odense, indents the northeast coast of Fyn in the northern approaches to Lille Bælt. The fjord is entered at the southern end of the coastal recession immediately westward of Fyns Hoved. The fjord is about 7 miles long and is shallow throughout. A winding channel with a least depth of $24\frac{1}{2}$ feet leads from the entrance to the head of the fjord. A canal with the same depth connects this channel with the port of Odense. Periodic dredging is essential to maintain the present depths in the channel and in the canal.

The coasts of Lille Bælt are irregular. A number of navigable fjords branch off from the passage and the coast recedes in places to form large bays. Small and large islands lie close off the shores of Jylland and Fyn and in most instances have navigable channels between them. Detached shoals and islands restrict navigation somewhat in the central part of the passage. In its northern part Lille Bælt is narrow but deep; in its southern part the passage is much wider and less encumbered with detached shoals. There is access to the passage

southward of Fyn between the southwestern extremity of this island and Ærø.

Some of the fjords indent the coast a considerable distance, up to 12 miles in the case of Vejle Fjord. Ports are located at the heads of the larger fjords. The most important fjords in Lille Bælt are Vejle Fjord, Kolding Fjord, Haderslev Fjord, Aabenraa Fjord, and Als Fjord. Odense Fjord, described above, is outside the geographical limits of Lille Bælt.

The coastal terrain in Lille Bælt for the most part is low. The area is extensively cultivated; the farm lands are interrupted here and there with large wooded areas. There are steep headlands at the entrances of some of the bays and fjords. Some of the points are prominent cliffs or steep bluffs and others are low and marshy. In some places the woods are backed by open fields or rolling hills and in some instances hilly slopes rise from the narrow beaches. There are also conspicuous isolated hills that serve as prominent marks for navigation.

There are numerous good anchorages throughout Lille Bælt. However, Snævringen and the channels between the islands and shoals cannot be regarded as good anchorages because they are narrow and strong currents set through them. In general, the bottom in the passage consists of sand, mud, and gravel, underlaid with clay, and is good holding ground.

The main channel in Lille Bælt begins in Tragten, a funnel-shaped body of water that lies between Trelde Næs and Stavrshoved, on the east, and Fredericia, on the west. It leads a tortuous course through Snævringen and passes westward of Fænø Kalv and Fænø; Snævringen is that part of the passage that lies between Fredericia and Stenderup Hage. Thence the channel passes eastward of Flækø-jet and enters Bredningen, the commodious roadstead in the central part of Lille Bælt. The channel continues through Baagø Sund and passes southward of the shoals that fringe Baagø and Aarø. From the latter position it

leads southward and passes between Hesteskoen and Søndre Stenrøn, on the east, and the island of Als, on the west.

There are secondary channels in Lille Bælt that are available to vessels of lesser drafts. These are Fænø Sund, which lies between Fænø and Fyn; Fyr Renden, which leads through the fairly deep water that separates the shoals between Baagø and Aarø; and Aarø Sund, which leads eastward of Linderum and between Aarø and the Jylland coast.

Although the main channel is intricate, navigation in it is not difficult as the fairways are adequately marked with navigational aids and the currents (sec. 3-3) generally follow the direction of the deep fairways. The secondary channels are also adequately marked with navigational aids.

Between the south coast of Fyn and the shores of Ærø and Langeland there are numerous islands that lie on an extensive shoal area. In this area there are several ports and loading places that are reached by means of intricate fairways. The main fairway, however, is the one that connects Store Bælt with Lille Bælt. This channel has a least depth of 22½ feet and follows rather closely the south coast of Fyn.

The principal ports within the scope of this chapter are Odense, Vejle, Fredericia, Middelfart, Kolding, Haderslev, and Aabenraa. The minor ports are Bogease, Assens, and Faaborg.

Pilotage is not compulsory in Lille Bælt. However, vessels desiring pilots for this passage can obtain them from the pilot vessel off Skagen and also at the pilot stations at Fredericia, Kolding, Assens, Aarosund, Aabenraa, Sonderborg and Graasten. Pilots from these stations also conduct vessels through the western part of the Baltic Sea, while pilots from Vejle and Fredericia conduct vessels to Skagen, Helsingør and Store Bælt as far as Korsør-Nyborg.

Fishery in Lille Bælt is carried on throughout the year. For details see section 1-9.

WATER LEVEL

3-2 The fluctuation of the water level attributed to tidal factors varies from negligible to small. The rise of water at the ports at the head of the constricted fjords is barely per-

ceptible. In Lille Bælt and the larger fjords that branch off from the passage the range of tide varies from about 1 foot to about $2\frac{1}{2}$ feet.

The direction, duration, and force of the winds exert varying influences on the water in different parts of the passage. In the northern part of Lille Bælt the water rises from about 2 feet to over 3 feet with strong winds from the northwest to the northeast and a southgoing current. The water level is lowered a like amount with strong winds from the southwest to the southeast and a northgoing current. In the southern part of Lille Bælt the water rises as much as 6 feet with strong winds from the northeast to the east, and gales from the southwest to the northwest lower the water the same amount. Greater differences in water level than those mentioned above may occur in the narrow channels throughout the passage during the prevalence of strong winds.

CURRENTS

3-3 The currents in Lille Bælt may set quite strongly, particularly in Snævringen. In Snævringen the currents may set obliquely to the direction of the channel and cause concern to the mariner when passing between the bridge piers and negotiating turns in the channel. In the other channels in the passage the currents generally follow the direction of the fairway.

The three factors governing the direction and velocity of the surface currents in Lille Bælt are (1) the exchange of fresh and saline waters between the Kattegat and the Baltic Sea, (2) winds, and (3) tides.

Seasonal effects.—In the spring when land drainage into the Baltic Sea is heaviest the prevailing current is northgoing. Sometimes this current may set in the same direction regardless of wind conditions. In the succeeding months the duration and strength of this current is more dependent on the prevailing winds. In the fall when the saline waters from the North Sea have made a greater penetration

into the Kattegat the prevailing current is southgoing; at this time the strength of the current is greater than that of the aforementioned northgoing current.

Wind effects.—In general, winds from the east-northeast through south to southwest produce a northgoing surface current and winds from other directions cause a southgoing surface current.

Southerly current.—The southgoing current upon entering Snævringen generally follows the direction of the channel but where there are sharp bends in the channel the current sets strongly onshore. This current strikes the coast with considerable strength about midway between Fredericia and Lyngs Odde. However, it does not enter Møllebugt. From Lyngs Odde the current sets toward Middelfart and then follows the coast of Fyn as far as Gals Klint where it sets across the channel toward the shore northwestward. The main current now passes westward of Fænø Kalv and sets toward Tønnes Odde. Farther southward the main current passes through Baagø Sund while a weaker branch of this current sets through Fyr Renden.

In Fænø Sund the southgoing current sets irregularly and is weak. Westward of Brandsø and Linderum a southgoing current sets occasionally and then only with northeasterly winds.

Eddies are formed in places where projecting headlands form sharp turns in the passage and deflect the main current. Eddies may exist off Fredericia, in the bight close southward of Strib Odde, and near the shore westward of Lyngs Odde. Frequently an eddy forms between Fænø Kalv and Fænø and extends up to Gals Klint.

Northerly current.—The northgoing surface current sets through Baagø Sund, Aarø Sund, and Fyr Renden; in Fyr Renden the current is sometimes quite strong. This current continues along the whole width of the passage

northward of the latter fairways and sets beyond Fænø Kalv and through Fænø Sund. It turns toward the Jylland coast about 1 mile northeastward of Børups Sand and follows the coast to Lyngs Odde. Then the current sets toward the coast of Fyn, which it follows northward, and in the vicinity of Fredericia it turns sharply to the eastward.

On occasions a weak countercurrent setting mostly in a southerly direction exists between Brandsø and Anslet Hage; this current is generally associated with southwesterly winds. In Snævringen, eddies form close northward of Lyngs Odde, off Middelfart, and close southward of Strib Odde.

ICE

3-4 The ice conditions in Lille Bælt vary each winter. The degree of ice coverage depends largely on the severity of the winter. Severe winters with ice conditions occur on the average of about once every 3 years. During these winters navigation without icebreaker assistance is either hampered or impossible. Ice has been known to grow to a thickness of 28 inches in this passage.

The first ice is observed at the heads of the fjords that branch off from Lille Bælt. It has been observed as early as the first week of November in Vejle Fjord and Haderslev Fjord and the middle of November in Kolding Fjord and Odense Fjord. The ice in these fjords generally disappears sooner than the ice in the passage proper; on an average the ice disappears during the first week of March.

The strong currents in Snævringen prevent to a great extent the formation of ice in these narrows. However, southward of a line drawn from Assen to Aarø, ice drifting in from the Baltic Sea is often encountered. Even after the ice has broken up, ice from the Baltic Sea may continue to drift in for some time.

See table 4 in chapter 1 for additional ice information.

Part A. NORTHERN APPROACH AND ENTRANCE TO LILLE BÆLT

3A-1 Fyns Hoved ($55^{\circ}37' N.$, $10^{\circ}36' E.$), the northwestern extremity of Hindsholm, is described in section 2A-1. The shorebank that fringes the northern and eastern sides of Fyns Hoved and the dangers and depths between this peninsula and Samsø are described in sections 2A-1 and 2A-3. The western side of Fyns Hoved is fringed by foul ground; the 6-fathom curve lies about $\frac{1}{3}$ mile offshore.

GENERAL

3A-2 The approach to Lille Bælt as considered by this volume is the geographical area lying between Fyns Hoved and Samsø, on the east, and Æbelø and Bjørnsknude, on the west. The south shore of the approach between Fyns Hoved and Æbelø, about $13\frac{3}{4}$ miles westward, is in general low and bare; several small wooded areas lie near the coast. Between these two positions there is a coastal indentation which gives access to Odense Fjord about $5\frac{1}{2}$ miles southward of Fyns Hoved. Æbelø, a wooded island 79 feet high, lies on the coastal bank about 2 miles off-shore and provides a contrast to the low coast.

The northern part of the approach to Lille Bælt between Samsø and Bjørnsknude, about $18\frac{1}{4}$ miles west-southwestward, is described in H.O. Pub. 41.

Odense Fjord is described in section 3A-8.

The entrance of Lille Bælt as defined in this volume lies between Æbelø and Bjørnsknude, on the east, and Tragten (secs. 3-1 and 3B-7), on the west. The south side of the entrance between Æbelø and Stavrshoved, about $12\frac{1}{4}$ miles west-southwestward, is low and partly wooded in its eastern part. In Baaring Vig, which lies between the small port of Bogense and Stavrshoved, there are hills rising from the lowland. The western side of the bay is partly wooded and rises to an elevation of 234 feet.

The northern side of the entrance between Bjornsknude and Trelde Naes is also the entrance to Vejle Fjord, which is described in section 3A-11. With the exception of Bjornsknude the shores of the entrance of Vejle Fjord are relatively high and wooded.

DEPTHS—DANGERS

3A-3 The depths and dangers on the northern side of the approach of Lille Baelt between Samso and Bjornsknude are described in H. O. 41. Those between Fyns Hoved and Samso are described in sections 2A-1 and 2A-3 of this volume.

In the approaches to Lille Baelt the general depths between the coastal banks, as defined by the 6-fathom curve, vary from about 6 1/2 to 17 fathoms. Depths in the central part of this area exceed for the most part 10 fathoms. In general this coastal bank does not extend more than 2 miles offshore except in the vicinity eastward of Aebelo where it may lie up to about 2 1/4 miles offshore.

In the entrance of Lille Baelt the depths do not exceed 10 fathoms. The aforementioned coastal bank extends up to 3 3/4 miles from the coast between Aebelo and the eastern side of Baaring Vig, and off Trelde Naes and Bjornsknude it may project up to 1 3/4 miles offshore. Elsewhere this bank lies within about 3/4 mile offshore.

Several detached patches with a least depth of 5 fathoms lie close off the coastal bank in the entrance of the passage.

A few wrecks with depths of 6 to 9 3/4 fathoms lie sunk in the approach and entrance to Lille Baelt.

WATER LEVEL

3A-4 The tidal effect on the water level in the approach and entrance to Lille Baelt is small and may vary from about 1 foot to about 2 1/2 feet.

Strong winds from a northwesterly to northeasterly direction may raise the water level

as much as 3 feet and even to 6 feet at some of the harbors; strong winds from a southeasterly to southwesterly direction may lower the water level about the same amount.

Additional data on water levels are given with the description of the individual ports.

CURRENTS

3A-5 The factors governing the movement of water in these waters are given in section 3-3. It is also mentioned in this section that for reasons other than wind influence the northgoing current predominates in the spring of the year and the southgoing current predominates in the fall of the year.

When winds are not an influencing factor (during periods of calm and settled weather) the northgoing current sets in a general east-northeasterly direction in the entrance and approach to Lille Baelt. Thence it sets northward between the island of Endelave and Samso where it is joined by a branch of the northgoing current from Store Baelt. The latter branch after breaking off from the main current in Store Baelt sets northward and southward of Paludans Flak and thence sets northward along the west side of Samso.

The southgoing current generally sets in the reverse of the direction of the northgoing current.

With strong winds from the northeast through east to south, the northgoing current from Lille Baelt sets in a general northeasterly direction along the coast of Fyn as far as Aebelo. From here it sets northward toward the east side of Endelave and thence sets eastward toward and along the west side of Samso. The northgoing current from Store Baelt sets toward the southeastern end of Samso where a branch of the current breaks off and sets southward and thence westward of Samso. This branch joins the current from Lille Baelt off the west side of Samso. An easterly wind strengthens the westerly set of this branch.

A small branch of the northgoing current from Lille Baelte breaks off at Aebelo and sets southeastward toward Odense Fjord; strong easterly winds reduce considerably the strength of this current.

When the wind factors governing a southgoing current are in force, the current from the Kattegat sends one branch of the current toward the entrance of Store Baelte and the other branch along the west side of Samso. The latter branch upon reaching the southwestern end of Samso divides into two arms; one arm sets in a general west-southwesterly direction toward Lille Baelte and the other arm sets in a general southeasterly direction into Store Baelte.

ICE

3A-6 The approach and entrance to Lille Baelte may be expected to have ice conditions for about 30 days of the year. This approximation is an overall average taken from a number of years of ice observations. During mild winters the area may be ice free. During severe winters ice may be present in sufficient quantities to bring navigation to a standstill.

The first ice appears in Vejle Fjord where it has been observed as early as the beginning of November. The average date of the appearance of the first ice in this fjord is the latter part of December, and the latest date of the first ice has been the first part of February.

For more details see table 4 in chapter 1.

COASTAL FEATURES—LANDMARKS

3A-7 The north coast of Fyn between Fyns Hoved and Agernaes, about 10 miles westward, recedes southward to form the approaches to Odense Fjord. The depths in this bay are less than 10 fathoms, but a depth of about 35 feet can be carried to the entrance of the fjord. The coastal bank, as defined by the 6-fathom curve, extends in one place on the eastern shore of the bay up to 1 1/2 miles

offshore and on the western shore it extends up to 1 3/4 miles offshore.

The eastern side of the bay between Fyns Hoved and Skoven, a bare rocky peninsula about 5 3/4 miles southward, is irregular and consists for the most part of a beach backed by woodless hills. Close southward of Fyns Hoved is the entrance to a shallow bay in which there are several islets up to 72 feet in height.

KORSHAVN, a good shelter for small vessels, is a small bight in the northern part of the aforementioned bay. The approach channel has depths of 14 to 15 feet and is entered about 1 1/4 miles southward of Fyns Hoved. Several rocky patches marked by buoys lie on either side of the seaward entrance. A light is shown on Korsore, a low point extending southward, which provides shelter to Korshavn from westerly winds. Beacons consisting of red and white poles surmounted by a triangle stand on Korsore and the head of the bight, respectively. There is anchorage in about 3 fathoms, good holding ground, inside Korsore.

SEA BUOY.—A light buoy equipped with a radar reflector is moored about 4 miles south-southwestward of Fyns Hoved and marks the approach to Odense Fjord.

DALBY BUGT, a small indentation immediately northeastward of Skoven, has general depths of 3 to 5 1/2 fathoms. It is sheltered from all except northwesterly winds and affords excellent anchorage, good holding ground, to small vessels.

In the western approach to Odense Fjord between Agernaes and Enebaerodde, a distance of about 11 miles, the coast is low and bare. The wooded areas at Agernaes and at Charlottelund, about 2 3/4 miles northwestward of Enebaerodde, stand out conspicuously. The churches at Krogsbolle and Hasmark, located about 1 1/2 miles and 1 mile inland in positions about 3 3/4 and 7 miles southeastward of Agernaes, are prominent landmarks. With offshore winds there is good anchorage anywhere along this coast.

A light is shown on Enebærødde.

The tidal currents in this coastal indentation set with varying rates of speed. The incoming current into Odense Fjord sets strongest along the coast of the western approach and the outgoing current sets strongest along the eastern side of the bay as far as Fyns Hoved. During settled weather the incoming current is the stronger of the two but with strong winds between southeast and southwest both currents may be of equal strength.

ODENSE FJORD AND ODENSE

Position: 55°25'N., 10°23'E.
Depths: Entrance, 8.0 m (26.2 ft.).
Channel, 7.5 m (24.6 ft.).
Canal, 7.5 m (24.6 ft.).
Berths, 4.0 to 7.5 m (13.1 to 24.6 ft.).

Tidal range: 1 to 2 feet.

Port Plans: See section 3A-9.

3A-8 Odense Fjord is entered between Enebærødde, a low point covered with bushes, and Skoven, a rocky promontory that is 36 to 49 feet high near the entrance. The fjord is quite extensive but is shallow over its greater part. Several islets of little significance are located in the fjord. A narrow and winding channel about 7 miles long leads through the shallows to Odense Kanal, the latter leads an additional 4 miles to the port of Odense. The bay immediately southward of Skoven has general depths of 13 to 18½ feet. Close southward of Enebærødde a narrow deep with general depths of 15½ to 32½ feet branches off westward from the main channel. The port of Odense ranks as the fourth port of Denmark and has accommodations and facilities for oceangoing vessels.

Tides and tidal currents.—The tidal range in Odense Fjord varies from 1 to 2 feet. Strong winds from the northwest to northeast may raise the water level as much as 6 feet and strong winds from the southeast to southwest may lower it about 5 feet.

During settled weather there is a regular flood and ebb current that changes every 6 hours. In the entrance to the fjord the tidal currents are strong; the approach of westerly gales increases the strength of the incoming current, whereas the strength and set of the outgoing current is dependent on the prevailing winds.

Ice.—Ice forms several days sooner in the fjord than it does in the canal and ice disappears a few days earlier in the canal than in the fjord. See sections 3-4 and 3A-6.

The greatest hindrance to navigation is caused by the ice that forms in the immediate approach to the fjord. An icebreaker is stationed at Odense and renders icebreaker service when required. The greatest observed thickness of ice was 24 inches.

Depths.—A least depth of 7 fathoms can be carried as far as the sea buoy. From the sea buoy to the fjord entrance off Enebærødde there is a least depth of 10.0 m (32.8 ft.) in the marked fairway. The entrance has a least depth of 8.0 m (26.2 ft.). The channel in the fjord and the canal have a least depth of 24 1/2 feet which is maintained by dredging. Since parts of the fairway are subject to silting, lesser depths can be expected. The channel has a least width of 82 feet. The canal has a width of 197 feet on the surface and 72 feet at the bottom along the straight reaches and 213 feet on the surface and 105 feet on the bottom at the curves. An average-size cargo vessel reported that because of the narrowness of the fairway the ship's condenser was partly plugged with mud and grass. A depth of 24½ feet is maintained over the greater part of the harbor.

Approach and entrance to Odense Fjord.—The channel from seaward to the entrance leads through the deepest water between the shorebanks fringing the entrance points. This channel is marked with buoys according to the Danish uniform system (sec. 1-15). The outer buoy is moored near the 5-fathom curve about 1¼ miles north-northeastward of Enebærødde.

Other than light buoys, all floating sea-marks on the starboard hand are fitted with white reflectors and those on the port are fitted with red reflectors.

A factory with a chimney stands on the western side of Skoven. A sewer outfall from the factory extends 275 yards into the water; its direction is indicated by beacons on the cliff above. A small harbor, with depths of 2.2 m (7.2 ft.), is located about 1/4 mile southward of the factory; it is used by pilot vessels only.

Skoven is fringed by a shorebank up to about 400 yards offshore, but Enebaerodde is fairly steep-to. A detached 19 1/2-foot patch lies on the eastern side of the fairway about 1/4 mile northward of Enebaerodde and two 12-foot patches lie nearly 1/2 mile south-southeastward and 1/2 mile southeastward of the same point.

ODENSE FJORD AND ODENSE KANAL.—Between the fjord entrance and the canal entrance the winding channel consists of seven reaches, each of which is indicated with range beacons. In addition the channel is marked with lighted and unlighted buoys in accordance with the Danish uniform system. Other than light buoys, all floating sea-marks on the starboard hand are fitted with white reflectors and those on the port hand are fitted with red reflectors.

At Bregnor, about 2 1/4 miles southeastward of Enebaerodde, there is a fishing harbor from which a light is shown.

Lindovaerftet, located on the southern side of the channel, about 2 3/4 miles south-southwestward of Enebaerodde, has two wharves extending about 600 yards in a northeasterly direction. The southwestern wharf, with a depth of 7.5 m (24.6 ft.) alongside, is protected by an L-shaped breakwater to northwestward. The northeastern wharf is 200 yards long, with a depth of 6.5 m (21.3 ft.) alongside, and with a short spur extending northwestward on the northeast corner. A basin, between the two wharves, is 160 feet wide, and extends about 300 yards south-eastward.

Klintebjerg, on the northern side of the channel, about 4 miles southwestward of Enebaerodde, has a small T-head pier with a depth of 2.5 m (8.2 ft.) at its head.

Submarine cables cross the channel between Klintebjerg and the pier at Vigelso, close southeastward. Several submarine cables also cross the canal elsewhere. The landing places of all these cables are indicated by beacons or warning boards. Overhead cables span the canal at several places; the least vertical clearance is 147 feet.

HARBOR.—The harbor lies at the head of the canal and consists of three cargo-handling basins and two turning basins. The east side of the canal between the basins and the oil berth about 800 yards northward is quayed to provide berths for large vessels. There is a large shipyard about 1 mile northward of the harbor. Benzinhavn, another oil berth, is located on the east side of the canal about 1/4 mile southward of the shipyard.

Vessels up to 525 feet long can be turned around in the swinging basins.

There is no anchorage in the harbor. Vessels can anchor just inside the fjord entrance to the southward of Enebaerodde in 20 to 35 feet, or in Dalby Bugt.

Storm warnings and ice reports are posted on the bulletin board on the north gable of the harbor master's office.

REGULATIONS.—The special regulations for navigating in Danish inland waters (sec. 1-39) apply to navigation in Odense Fjord, with the following additions.

1. In the canal, power-driven vessels must not exceed a speed of 6 knots.

2. Special care must be exercised when passing vessels moored in the canal and lighters and rafts, whether underway or not; if necessary the engines must be stopped.

3. During ice conditions in the fjord and canal, vessels must abide by the instructions given by the harbor master, and also the special instructions which may be published from time to time.

PILOTAGE is compulsory between Stige and Odense for vessels of 100 gross tons and over, except those that are owned locally or make Odense their home port. Stige is located on the east side of the canal about 2 3/4 miles southward of Klintebjerg. Pilots are stationed at Stige and at a small boat harbor on the southwestern side of Skoven. Pilots will board vessels outside the fjord entrance. Mariners are advised to employ a pilot in the winding channel in Odense Fjord.

DIRECTIONS.—A vessel with a draft of 19 feet and less upon arriving at the sea buoy should steer 175° for Munkebo Bakke (Loddenhoj), a 190-foot hill located about 3 miles southward of the fjord entrance. This course leads to the entrance where the vessel should be guided by the buoys marking the fairway. Vessels drawing more than 19 feet upon arriving off the sea buoy should steer southeastward toward the outer buoy located about 1 1/4 miles north-northeastward of Enebaerodde and thence steer through

the buoyed fairway to a position southward of Enebaerodde. If there is no pilot aboard, vessels are advised to anchor southward of Enebaerodde and await a pilot.

3A-9 ODENSE, the third largest city of Denmark is an important commercial and industrial center with a population of about 132,978 (1965). In addition to being a distributing center for the trade of the island of Fyn, it is engaged in shipbuilding, food processing, and manufacturing of machinery, rubber, textiles, and glass. The city imports large quantities of coal. The harbor master's office and the custom house are located near the foot of the western basin.

The principal berths in Bassin I, the eastern basin, are Englandskaj which has a length of 815 feet and a depth of 24 1/2 feet, the Coal Quay which has a length of 715 feet and depths of 6.5 to 7.5 m (21.3 to 24.6 ft.), and the Grain Quay which has a length of 840 feet and a depth of 24 1/2 feet. In Bassin II, the main berths are Finlandkaj which has a length of 810 feet and a depth of 24 1/2 feet, Stenfiskerkaj which has a length of 500 feet and depths of 14 1/2 to 19 1/2 feet, and Gamle Havnekaj which has a length of about 1,250 feet and depths of 4.0 m (13.1 ft.).

Bassin III, the western basin, has three berths with lengths of 1,000 feet, 260 feet, and 820 feet, respectively, with depths of 24 1/2 feet alongside.

On the eastern side of the canal, Mollekaj and Norgekaj have a combined length of about 2,500 feet with 7.5 m (24.6 ft.) alongside. At Benzinhavn, there is a T-shaped berth, about 64 feet long, alongside which there is a depth of 6.0 m (19.6 ft.). A short jetty connects this berth with the shore.

The shipyard has a fitting-out berth that is 400 feet long and has a depth of 5.0 m (16.4 ft.).

The Coal Quays are equipped with coal transporters with a capacity varying up to 150 tons per hour. There are grain elevators on the Grain Quay and Mollekaj. A 10-ton fixed crane stands on Gamle Havnekaj and there is a 45-ton crane at the shipyard.

All the principal berths are served by the railroad.

Provisions and diesel oil are available. Water is piped to the main berths. Large stocks of coal are maintained in the port. The shipyard does not have drydocking facilities. There is a marine railway with a lifting power of 500 tons in Bassin II. A tug and an icebreaker are available. Odense has all the modern communications of a large port. The port has rail connections with the Continent and with Kobenhavn. There are several hospitals with modern facilities in the city.

DERATTING.—See section 1-7.

COASTAL FEATURES—LANDMARKS (continued)

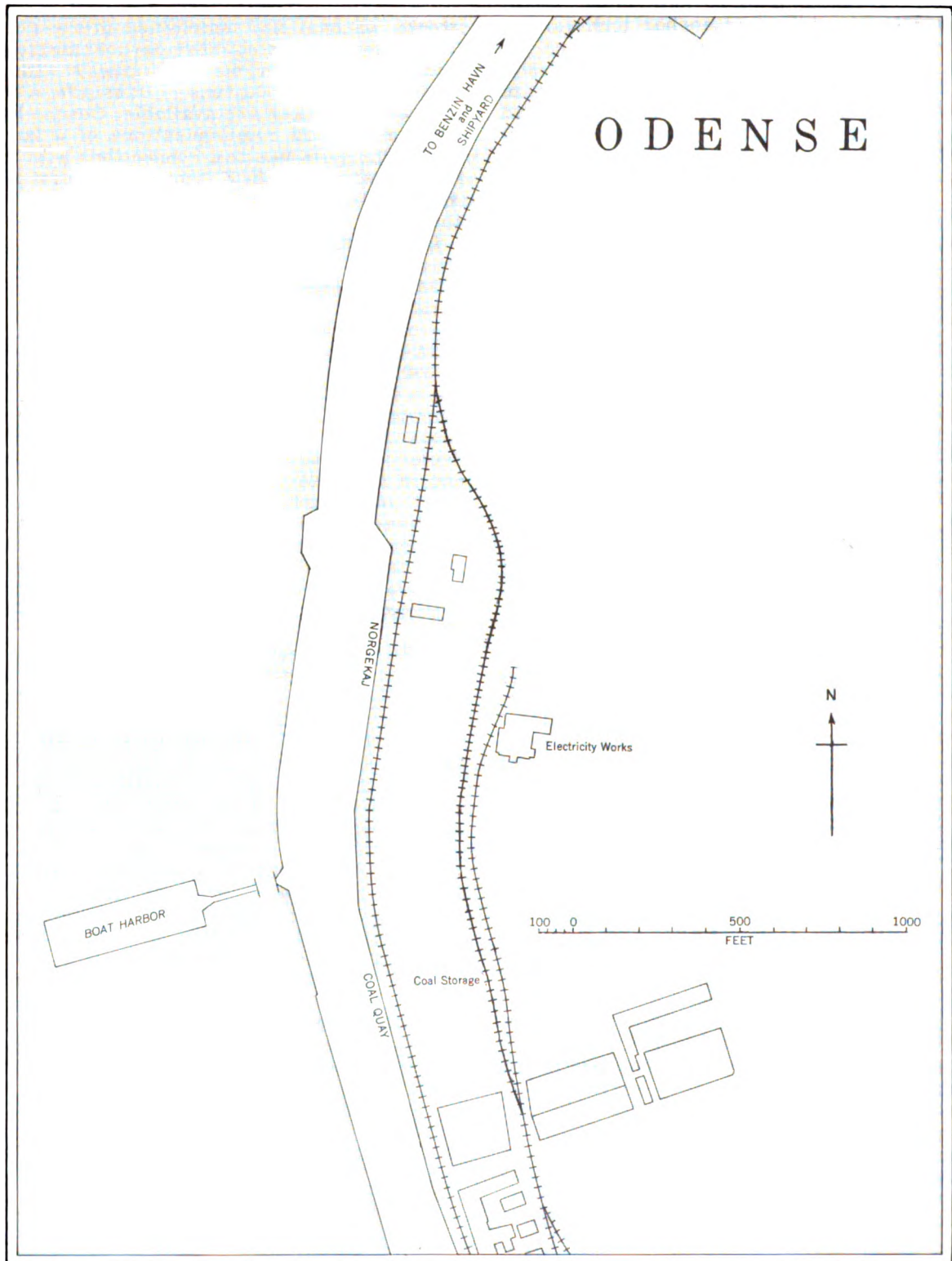
3A-10 Between Agernaes and Aabelo, about 3 3/4 miles west-northwestward, the low coast is fronted up to 2 3/4 miles by a shorebank that almost dries in places. Close south-eastward of Aabelo there is a basin with depths of 13 to 16 1/2 feet in the entrance and 16 1/2 to 27 1/2 feet in the basin proper. Good anchorage sheltered from all except northwesterly to northeasterly winds may be taken here by small vessels. A submarine cable from Aabelo to the coast is laid through the southwestern part of this basin; beacons mark the landing places of this cable.

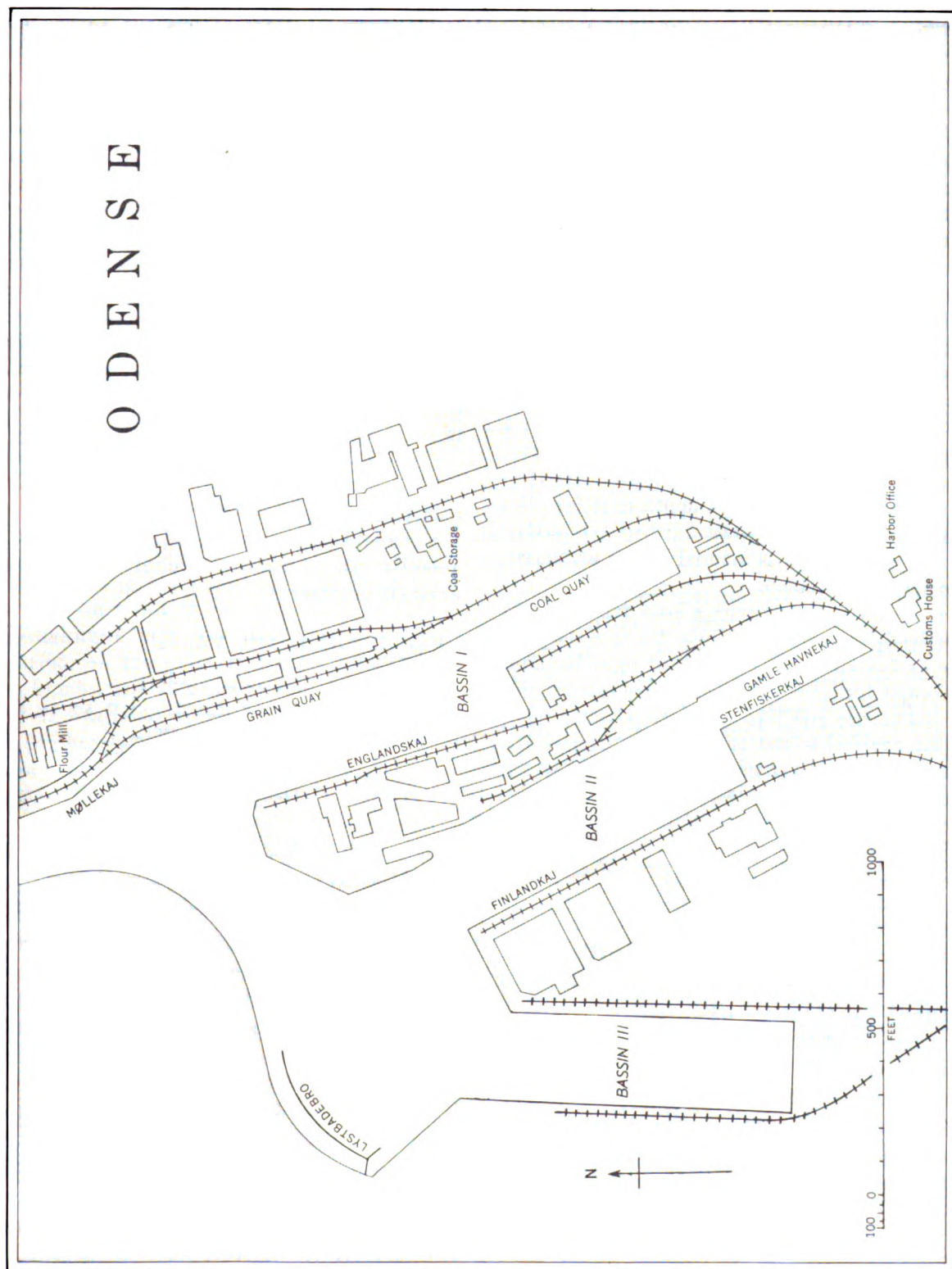
AEBELO, about 2 miles offshore, is a wooded island with light-colored bluffs on its seaward side. A light is shown on the northwestern extremity of the island. A shallow harbor enclosed by moles but closed to shipping (1966) is located on the western side of the island.

Several small islets lie on the nearly dry sand flat between Aabelo and the mainland. A narrow strip of land connects Aabelo with the islet about 1 mile southward.

Aabelo is fringed by a shorebank, as defined by the 6-fathom curve, that extends nearly 1 mile northwestward and westward from the island. A buoy marks the northern extremity of this shorebank.

Good anchorage sheltered from all except northwesterly winds may be taken in about 5 fathoms off the southwestern side of Aabelo. Care must be taken to avoid the 2 1/2 fathom shoal located about 1 mile southwestward of this island.





Bogense.—The small port of Bogense fronts the town of the same name in a position nearly 5 miles scuthwestward of Æbelø. The harbor consists of a basin that projects about $\frac{3}{8}$ mile from the shore. The basin is only about 70 feet wide over its greater part, but it provides a berth with a depth of $13\frac{3}{4}$ feet alongside a length of about 1,900 feet.

A **light** is shown on the east side of the harbor entrance. The church in the town is a prominent landmark. Two chimneys on the southwestern side of the harbor serve as landmarks.

In the vicinity of the port the shorebank extends nearly $2\frac{1}{4}$ miles offshore and there are several detached patches with depths of 5 to $5\frac{3}{4}$ fathoms farther offshore. A rock with a depth of 10 feet lies about $1\frac{1}{4}$ miles north-northeastward of the harbor entrance. Holmen, a stony patch with a depth of 5 feet, lies a short distance northwestward of the harbor entrance. A **buoy** is moored on the northeastern side of this patch.

A dredged channel with a least depth of $13\frac{3}{4}$ feet leads in two reaches over the shorebank to the harbor entrance. A pair of **light beacons** in range $164\frac{1}{2}^\circ$ are located on the eastern side of the harbor and lead through the outer reach of the channel to the eastward of Holmen. The inner reach leads southward to the harbor entrance. A **light buoy** is moored at the northern end of the outer reach of the channel. A lighted buoy is moored close northward of the harbor entrance.

The range of **tide** is about $1\frac{1}{2}$ feet. The **water level** is raised about 5 feet by strong winds from the northwest to the northeast and is lowered 5 feet by strong winds from the southwest to the southeast.

There is **anchorage** in 16 to 18 feet, good holding ground, between the harbor entrance and Holmen. Northerly and northeasterly winds raise the highest seas here because with these winds the current often runs in the opposite direction.

Local pilots are available.

The town of Bogense has a population of 3,000. Meat canning and manufacturing of farm machinery are the main industries. The main berth in the harbor is served by a railroad that runs to Odense. Water, provisions, and coal are available. There is a small marine railway with a lifting capacity of 100 tons.

Baaring Vig.—Fogense Pynt lies about $1\frac{1}{2}$ miles westward of Bogense; between these two positions the 5-fathom curve lies less than 2 miles offshore. Baaring Vig is entered between Fogense Pynt and Stavrshoved, about $6\frac{1}{2}$ miles westward. There are general depths of 11.0 to 17.0 m (6.0 to 9.3 fm) in the bay. The 5-fathom curve lies less than 1 mile offshore in the greater part of the bay.

During offshore winds there is good **anchorage**, mud and clay bottom, in the southwestern part of the bay. The church at Røjleskov and the triangulation station on Katrinebjerg, both about 1 mile southwestward of Stavrshoved, are good landmarks.

VEJLE FJORD AND VEJLE

Position:	55°43'N., 9°33'E.
Depths:	Outer fjord, 11.0 to 16.4 m (6.0 to 9.0 fm). Inner fjord, 5.5 to 9.2 m (3.0 to 5.0 fm). Dredged channel, 7.0 m (22.9 ft.). Berths, 5.6 to 7.3 m (18.3 to 23.9 ft.).
Tidal range:	About 2 feet.
Port plan:	See section 3A-12.

3A-11 Vejle Fjord is entered between Bjørnsknude and Trelde Næs and extends westward about 14 miles to the port of Vejle. The land is high and wooded on both sides of the fjord. There are no detached dangers outside the fringing shorebank.

The harbor of Vejle lies at the head of the fjord on a low neck of land and consists of an enclosed basin. There is a least depth of 21 feet in the approach to the port, and vessels up to 500 feet in length can under favorable conditions enter the harbor.

Tides and water level.—The tidal range is about 2 feet. Strong northwesterly to northeasterly winds may raise the water level about 5½ feet and strong southwesterly winds may lower it about 5 feet. Easterly winds may cause a strong current in the inner part of the dredged channel.

Ice.—See section 3A-6 for details. Icebreakers keep the port open as long as The Sound and Belts are navigable.

Depths.—Between the fjord entrance and Holtserhage, about 7½ miles northwestward of Trelde Næs, there are general depths of 6 to 9 fathoms between the 6-fathom curves that define the shorebank. This shorebank varies in width from several hundred yards to about 1 mile.

Between Holtserhage and the harbor there are general depths of 3 to 5 fathoms. A fairway about 1¾ miles in length and with a least depth of 6.5 m (21.3 ft.) leads from the outer fjord to the dredged channel.

The dredged channel is about 2 3/4 miles in length and has a depth of 7.0 m (22.9 ft.) (1967) over a width of 103 feet.

Bjørnsknude is a low sandy point. The sanatorium on the point is a good landmark. Bjørnsknude Rev, a steep-to shoal area with less than 3 fathoms over it, extends about 1½ miles southeastward from the point. A **buoy** is moored on the outer end of this danger.

Trelde Næs, a wooded peninsula that rises to a height of 154 feet, is low at its eastern end. A **light** is shown on this low point. Kasserodde Flak, a shoal area with depths of 3 fathoms and less, extends about 1½ miles eastward from the point. The outer end of this danger is marked by a **buoy** that is moored in a depth of about 24 feet. The 6-fathom curve lies about ½-mile southeastward of the buoy.

Outer fjord.—The prominent landmarks on the north side of the fjord are as follows: the church at Klakring, about 2 miles northwestward of Bjørnsknude; Barritskov Manor, located about 1-mile inland about 3¾ miles west-northwestward of Bjørnsknude; Rosenvold Manor, near Rosenvold Pynt about 2¾ miles north-northwestward of Trelde Næs; and the sanatorium near Træskohage, the latter located about 2½ miles west-northwestward of Rosenvold Pynt. A **light** is shown on Træskohage.

Hvidbjerg, a very prominent white sandhill 92 feet high, stands on the south shore about 4 miles west-northwestward of Trelde Næs.

A light buoy is moored in 7 fathoms on the edge of the steep-to shorebank close southward of Rosenvold Pynt. A light buoy moored in 5 fathoms marks the edge of the shorebank close southward of Træskohage. Several buoys are moored in the outer fjord and mark the fairway.

In the approach to the pilot station the deeper water is found on the south side of the fjord.

Inner fjord.—A steep-to sandspit extends several hundred yards northward and eastward from Holtserhage. A **light buoy** is moored in a depth of about 8.6 m (28.2 ft.) close northward of this spit.

The dredged channel is entered a little over 1 mile west-northwestward of Holtserhage. The channel consists of two reaches and is marked by buoys and light buoys according to the Danish buoyage system (sec. 1-15). The inner reach is indicated by a pair of light beacons in range 288°; the beacons are located in the harbor. A **light** is shown on the south mole of the harbor entrance.

Harbor.—The harbor consists of a single artificial basin fronting the town of Vejle.

The basin comprises a yacht basin immediately within the entrance on the northern side, a turning basin westward of the yacht basin, and an inner basin. The yacht basin is suitable only for small craft. The swinging basin has a depth of 6.0 m (19.6 ft.). Vessels 550 feet long and drawing up to 23 feet can be turned in this basin.

The inner part of the basin is quayed for berthage and can accommodate oceangoing vessels.

Vejle Aa discharges through a canalized channel a short distance southward of the harbor entrance.

Anchorage can be taken anywhere in the fjord. There is anchorage for small vessels in 3 fathoms, clay, close westward of Bjørnsknude and also in the bight close westward of Holtserhage. Anchorage can be taken in 4 fathoms about $\frac{1}{4}$ mile offshore at Tyrsbæk, located about $1\frac{1}{4}$ miles northwestward of Holtserhage.

Larger vessels can anchor in 5 fathoms, soft bottom, poor holding ground, westward of Rosenvold Pynt. Vessels may also anchor northward of Holtserhage in 4 to 5 fathoms, bottom thickly covered with seaweeds.

Regulations.—In addition to complying with the special regulations for navigating in Danish inland waters (sec. 1-39), vessels must, (1) reduce speed to 4 knots or less in the immediate approach to the harbor entrance and, (2) during ice conditions, abide by the harbor-master's instructions and also the special instructions that are published in the Notices to Mariners.

Pilots are available upon request from the harbor master at Vejle.

Directions.—Since the fjord is clear of detached dangers, an average-size vessel need only to keep in the middle of the fjord until near the entrance of the dredged channel. The dangers off Rosenvold Pynt, Træskohage, and Holtserhage are marked by buoys. The fairway is also marked by buoys.

Vessels approaching from the southward are to take care to pass eastward of Kasserodde Flak before entering the fjord.

3A-12 VEJLE is an old town with a population of about 42,000 (1966). It is an industrial and commercial center; the principal industries are textiles and iron foundries. Coal, grain, fertilizer, and timber are the main imports, and agricultural products and coals are the main exports. The custom-house is located near the head of the harbor. The harbor-master's office is located close northward of the inner end of the harbor.

Large vessels berth in the inner basin which is about 2,500 feet long and 230 feet wide. The north quay of this basin has a berthing length of 1,650 feet and a depth of 7.0 m (22.9 ft.) alongside. The south quay has a berthing length of about 2,200 feet and depths of 5.6 to 7.3 m (18.3 to 23.9 ft.) alongside. The west quay has a small pier projecting from it; it is suitable only for lighters or for landing passengers.

The north quay has two fixed bridge transporters for the discharge of coal and a fixed crane with a capacity of 10 tons. The south quay has one traveling bridge transporter for the discharge of coal, two grain elevators, and two travelling cranes with a capacity of 3 tons. Railroad tracks are laid on the quays. Tugs are available.

Provisions, coal, and a limited amount of fuel oil are available. Water is piped onto the quays.

Small repairs can be effected.

The town is connected with the national railroad system and has other modern means of communication. There are several modern hospitals in the town.

Deratting.—See section 1-7.

ANCHORAGES

3A-13 Korshavn.—See section 3A-7.

Dalby Bugt.—See section 3A-7.

Western approach to Odense Fjord.—See section 3A-7.

Odense Fjord.—See section 3A-8.

Æbelø.—See section 3A-10.

Bogense.—See section 3A-10.

Baaring Vig.—See section 3A-10.

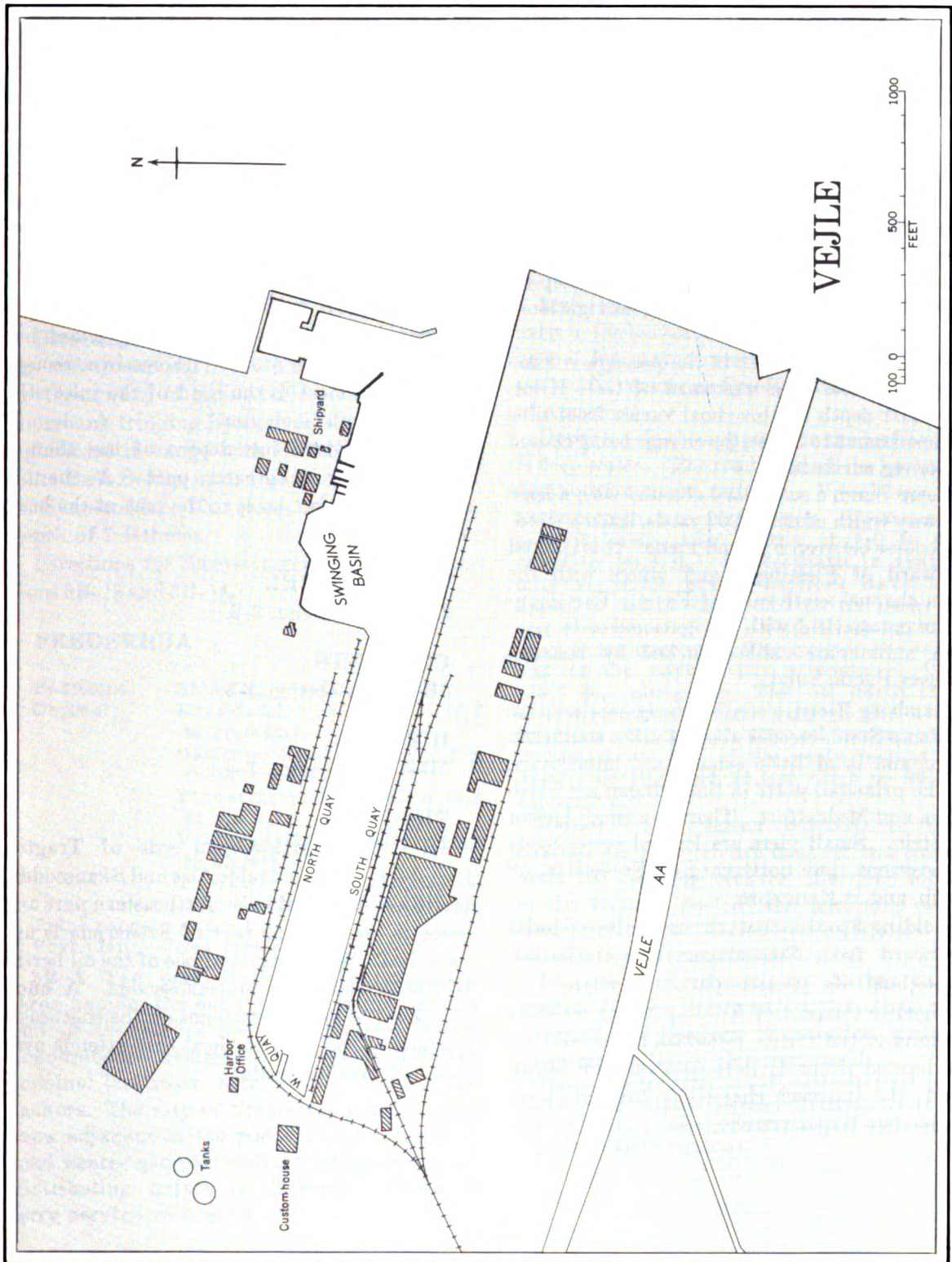
Vejle Fjord.—See section 3A-11.

Part B. NORTHERN PART OF LILLE BÆLT

3B-1 Trelde Naes ($55^{\circ}38' N.$, $9^{\circ}52' E.$), the northern entrance point of Tragten, is described in section 3A-11.

GENERAL

3B-2 The northern part of Lille Bælt as defined by this volume comprises Tragten and



Snævringen, both lying between Trelde Næs and Stenderup Hage about 11½ miles south-westward. Kolding Fjord is also included in this description.

Snævringen follows a winding course for about 10 miles. The fairway in this passage is quite narrow, being about 500 yards wide off Gals Klint. Lille Bælt Bridge further restricts the fairway to a width of about 200 yards between the main piers. However, the passage is not difficult to negotiate because it is deep, the shorebanks in most places are fairly steep-to, and there are numerous guiding navigational marks.

The principal danger in the passage is Flessingen, a shoal area westward of Gals Klint. The least depth on this shoal varies from time to time from 8 to 5 feet, the change being caused by strong currents.

Fænø Sund, a secondary channel with a least fairway width of about 200 yards, leads a winding course between Fyn and Fænø. It is entered eastward of Flessingen and unites with the main channel southward of Fænø. This channel is not marked with navigational aids.

A submarine cable, marked by beacons, crosses Faeno Sund.

Gamborg Fjord, a southeasterly continuation of Fænø Sund, recedes about 4 miles southeastward and is of little commercial importance.

The principal ports in Snævringen are Fredericia and Middelfart. There is a small harbor at Strib. Small piers are located respectively in positions close northward of Fredericia, off Strib, and at Kongebro.

Kolding Fjord indents the coast about 5 miles westward from Snævringen. It is shallow throughout its greater part. A channel is dredged to the port of Kolding which occupies the head of the fjord. Skærbæk is a small harbor located about ¾ mile westward of Børup Sand; the approach channel is dredged to accommodate larger vessels.

DEPTHS—DANGERS

3B-3 In **Tragten** there are general depths of 5 to 13 fathoms between the shorebanks. In the vicinity of Røjle Klint the depths increase sharply and become irregular. The shorebank off Fyn and near Skanseodde is very steep-to. An unmarked 3-fathom patch lies about 1¾ miles northeastward of Skanseodde.

In **Snævringen** the depths are very irregular and vary from about 6 to 44 fathoms. A detached 28½-foot patch lies close off the shorebank southward of Lyngs Odde.

Faenø Sund has depths of about 6 to 15 fathoms in the fairway. Gamborg Fjord has general depths of 3 to 7 fathoms in a trough that leads almost to the head of the inlet; the head of the inlet is shallow.

Kolding Fjord has depths of less than 3 fathoms over its greater part. A channel dredged to 23 feet leads to the port at the head of the fjord.

WATER LEVEL

3B-4 See section 3-2.

CURRENTS

3B-5 See section 3-3.

ICE

3B-6 See section 3-4.

TRAGTEN

3B-7 The northwestern side of Tragten (sec. 3-1), between Trelde Næs and Skanseodde, is cliffy and wooded in its northeastern part and becomes lower as the port of Fredericia is approached. A tank farm of one of the oil berths in Fredericia stands on Skanseodde. A **buoy** is moored in about 2 fathoms on the southeastern side of the steep-to shoal that extends over ¼ mile from Skanseodde.

A ruined pier is located at Hybylund, about 1¼ miles north-northeastward of Skanseodde. A sewer outfall marked by a buoy discharges about 400 yards southwestward of the ruined pier.

The south side of Tragten, between Stavrs-hoved and Strib Odde, is steep and wooded to a position close westward of Røjle Klint and thence it becomes lower as Strib Odde is approached.

A light is shown on Strib Odde.

A light is shown off Skanseodde, about 1 mile north-northeastward of Strib Light.

Directions.—Vessels passing through Tragten and attempting to avoid the 3-fathom patch northeastward of Skanseodde and the steep-to shorebank fringing Fyn should steer with Strib lighthouse in range with the northern end of Lille Bælt Bridge until abeam of the tank farm on Skanseodde. This range leads over a least depth of 7 fathoms.

Directions for Snæveringen are given in sections 3B-13 and 3B-14.

FREDERICIA

Position: 55°34'N., 9°46'E.
Depths: Roadstead, 11.0 to 36.5 m (6.0 to 20.0 fm).
 Gammel Havn, 5.6 to 6.3 m (18.3 to 20.6 ft.).
 Fiskerihavn, 1.8 to 3.0 m (5.9 to 9.8 ft.).
 Vesthavn, 7.0 to 9.0 m (22.9 to 29.8 ft.).
 Tanker berths, 9.0 m to 15.0 m (32.8 to 49.2 ft.).

Tidal range: About 1 1/4 feet.

Port plan: See section 3B-9.

3B-8 The port of Fredericia comprises three basins, the quay located in the eastern end of the harbor and a roadstead. It can accommodate average-size vessels and has terminal facilities outside the basins for tankers. The city of Fredericia occupies the area adjacent to the port. It is a large railroad center and one of the leading petroleum distributing points of Denmark. There is ferry service with Strib.

Tides and water level.—The tidal range is about 1¼ feet. Northerly and easterly winds may raise the water level about 4½ feet and southerly and westerly winds may lower it about 5¼ feet.

Currents.—The current off the harbor entrance nearly always sets in an easterly direction because an eddy is formed off Fredericia when a southgoing current is running in Lille Bælt, and the northgoing current follows the direction of the coast. See section 3-3 for additional information.

Ice.—During severe winters, ice conditions exist in the harbor, but icebreakers keep the port open. Ice may appear as early as the latter part of November and remain until the first part of April.

Depths.—In the approach to the harbor there is deep water. The roadstead off the harbor has depths of 6 to 20 fathoms. Vessels can take anchorage in 8 to 14 fathoms. Vesthavn, the largest basin, has depths of 7.0 to 9.0 m (22.9 to 29.8 ft.). Fiskerihavn is available only to small craft. Gammel Havn has a depth of 5.6 m (18.3 ft.) in its inner part and a depth of 6.3 m (20.6 ft.) alongside the quay in its engrance. The quay in the eastern end of the harbor has a depth of 12.0 m (39.3 ft.) alongside. The oil berth off the southwestern side of Vesthavn has a depth of 9.0 m (29.5 ft.). The oil berths at the southeastern end of the eastern quay have depths of 10.0 and 15.0 m (32.8 to 49.2 ft.) alongside.

Harbor.—The harbor consists of three basins, all of which are quayed; two mooring piers for berthing tankers; the quay located in the eastern part of the port area and a roadstead. The basins are enclosed and have independent entrances.

The roadstead fronts the harbor and includes Møllebugt, a small bight close westward of the harbor. Skanseodde provides some protection to this roadstead.

The quay located in the eastern part of the harbor is supplemented southeastward by two offshore wharfs which provide berths for large tank vessels.

Gammel Havn is a dog-leg basin about 950 feet long. The entrance is about 80 feet wide and the basin proper is about 150 feet wide. A ferry slip is located at the head of the basin.

Fiskerihavn, a small basin used by small craft, has an entrance about 50 feet wide.

Vesthavn, a rectangular-shaped basin, is about 1,700 feet long and about 375 feet wide. The entrance to this basin is about 200 feet wide and has a depth of $29\frac{1}{2}$ feet. An oil berth is located off the southwestern corner of Vesthavn. A tank farm stands on the shore northward of the oil berth.

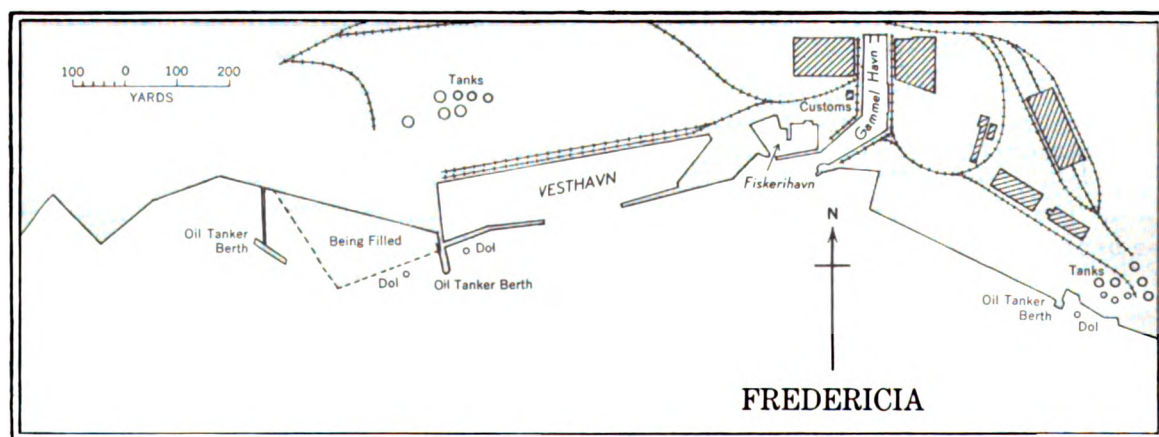
Lights are shown from various places in the harbor. Leading lights, in line 304° , are occasionally exhibited west-northwestward of Vesthavn, leading alongside the L-shaped tanker berth (sec. 3A-9). A light is exhibited from the northern end of a breakwater about $\frac{1}{2}$ mile west-southwestward of Vesthavn. A pair of **beacons** consisting of black and yellow vertically striped triangles stand near the mouth of a creek nearly $\frac{3}{4}$ mile southwestward of Vesthavn. In range 259° these beacons mark the southern limit of a bird sanctuary.

Anchorage can be taken in the roadstead but not westward of the harbor entrance as the bottom there is rocky. Large vessels anchor in 12 to 14 fathoms and smaller vessels anchor in 8 to 10 fathoms. Northerly gales render this anchorage insecure as the shorebank is too steep for the anchor to hold. Strong north-easterly winds with a northgoing current cause a short and irregular sea off the harbor and send in considerable swell round Skanseodde, making the anchorage somewhat untenable.

Small vessels can anchor on the shorebank in Møllebugt in about $2\frac{1}{4}$ fathoms, clay, and be out of the strength of the current.

Pilotage is not compulsory, but pilots are available. They will also pilot vessels northward to Aarhus, eastward to Odense Fjord, and southward through Lille Bælt and to Svendborg Sund.

3B-9 FREDERICIA, a former fortress town, stands on the low land around the harbor and Skanseodde. The main part of the town lies within a quadrant of moats and ramparts. The population numbers 33,865 (1967). The principal industries are the manufacture of chemicals, fertilizer, textiles, and iron products. Fishery is one of the lesser pursuits. Petroleum products are imported, mainly for distributing purposes. Large amounts of coal are imported for domestic consumption. The customhouse and harbor offices are situated near Gammel Havn.



The quay located eastward of Gammel Havn is about 1,200 feet in length with a depth of 12.0 m (39.3 ft.) alongside.

Gammel Havn: The two berths on the east side of this basin have a depth of 5.6 m (18.3 ft.); one berth is 280 feet in length and the other is about 250 feet in length. The west side of the basin has a berth about 460 feet in length and 5.6 m (18.3 ft.) in depth. The southeast side of the basin has a berth about 450 feet in length and 5.6 to 6.4 m (18.3 to 20.9 ft.) in depth. The southwest side of the basin has a berth about 330 feet in length and 20 1/2 in depth. On the east quay there is a 3-ton traveling crane and on the west quay there is a 5-ton fixed crane.

Vesthavn: The north side of this basin has a berth about 1,675 feet in length and 23 to 29 1/2 feet in depth. The berth on the southeast side of the basin is about 330 feet in length and 23 feet in depth. The moles that form the south side of the basin are quayed along the inner side. The east mole is about 380 feet in length and the west mole is about 850 feet in length; there is a depth of 23 feet alongside both moles. On the north quay there are three fixed bridge transporters for the discharge of coal and one 2 1/2-ton traveling crane.

Oil berths: The Shell oil berths at the southeastern end of the eastern quay have depths of 10.0 to 15.0 m (32.8 to 49.2 ft.) alongside. The deeper berth will accommodate tankers up to 800 feet in length with drafts to 48 feet. The least depth from sea to berths is 15.0 m (49.2 ft.). Tankers berth and unberth day or night depending on wind and current. Tugs are available. The Forenede oil berth at the southwestern corner of Vesthavn is about 450 feet in length and has a depth of 29 1/2 feet alongside. An L-shaped pier with a depth of 36 feet alongside is located about 300 yards westward of Forenede oil berth.

The quays have rail connections and the oil berths are equipped with pipelines.

Provisions, coal, and fuel oil are procurable. Water is available at the quayed berths. Minor repairs can be effected. A small marine railway with a lifting capacity of 100 tons is located in Fiskerihavn.

Fredericia has modern means of communication, in addition to being a railroad center on Jylland. There are large hospitals in the town.

· SNAEVRINGEN—NORTHERN PART

3B-10 The northern part of Snaevringen is defined in this volume as comprising the two reaches of the passage between Fredericia and Gals Klint. The passage is deep but narrow. Lights are shown from various places in the passage and from Lille Baelte Bridge for guidance through the fairway, through the bridge, and to the several small harbors.

The western and northern shores of this passage are steep-to. The only danger is a detached 28 1/2-foot patch that lies about 1/4 mile southward of Lyngs Odde where the passage makes a sharp turn to the west-northwestward.

Anchorage can be taken off Lyngs Odde in 6 1/2 to 8 fathoms and out of the strength of the current in a position about 325 yards offshore with Lyngs Odde in range with Strib Odde.

A wharf, 180 feet long with 9.0 m (29.5 ft.) alongside, fronts the shore about 1/4 mile northward of the southeastern extremity of Lyngs Odde.

In 1970, a bridge was under construction between Lyngs Odde and the shore east-southeastward. The works are marked by lights and light buoys and a fog signal is sounded. Vessels should navigate with caution in this area.

At the town of Snoghoj, about 3/4 mile westward of Lyngs Odde, there is a small boat harbor. A light is shown from this harbor. The northern terminal of Lille Baelte Bridge, described below, lands in Snoghoj.

Between Snoghoj and Damgaard, about 2 miles west-northwestward, there are four lights that guide vessels through Lille Baelte Bridge and the sharp turn in the passage off Gals Klint. Damgaard can be identified by its high light-red building.

SNOGHOJ LIGHT, about 3/4 mile west-northwestward of Snoghoj, and **Borup North Light**, about 1/2 mile farther west-northwestward, are used to negotiate the turn in the passage off Gals Klint. **Borup West Light**, a few hundred yards westward of Borup North Light, and **Damgaard Light**, a short distance farther westward, are used to pass through the bridge and the western end of the northern part of Snaevringen.

ANCHORAGE can be taken off Damgaard in 6 to 7 fathoms in a position where the building in Damgaard can be seen between the woods.

The eastern and southern shores of this passage are also steep-to, with the shorebank extending its greatest distance, about 350 yards, from the eastern shore.

STRIB HAVN, close southward of Strib Odde, consists of two small basins sheltered westward by breakwaters; depths are 2.0 to 6.0 m (6.5 to 19.6 ft.). The northern basin is privately owned; the southern basin can only be entered by tank vessels under 1,000 DWT.

MIDDELFART

Position: 55°30'N., 9°44'E.
 Depths: Approaches, deep.
 Nordiske Cable and Wire Wharf, 4.0 to 5.7 m (13.1 to 18.7 ft.).
 Hansens Havn, 4.0 m (13.1 ft.).
 Ny Havn, 5.6 to 6.6 m (18.3 to 21.6 ft.).
 Tidal range: About 1 foot.
 Port plan: See section 3B-12.

3B-11 The port of Middelfart fronts the town of Middelfart about 2 1/4 miles south-southwestward of Strib Odde. The harbor consists of the small basin of Gamle Havn, the marginal facilities of Ny Havn, and the approaches to and the wharf at Hansens Havn. Nordiske Cable and Wire Factory stands on the small promontory close eastward of Hansens Havn and has wharfage for berthing. The church in the town, the chimney at the cable and wire factory, and an insane asylum consisting of a group of light-colored buildings are prominent landmarks.

DEPTHS.—In general the 5-fathom curve lies less than 100 yards from the berths excepting Hansens Havn. A dredged channel about 100 yards long and with a depth of about 17 feet leads to Hansens Havn.

WATER LEVEL AND CURRENT.—The tidal range is about 1 foot. Strong winds from the east and northeast raise the water level about 4 feet and strong winds from the west and southwest lower it a little over 3 feet.

There is generally a westerly current off the harbor when a northgoing current is setting in Lille Bælt.

ICE CONDITIONS occur occasionally but navigation is rarely hampered; icebreakers are never necessary in the harbor. Ice may appear as early as the latter part of December off the harbor and the middle of January in the harbor and remain as late as the latter part of March off the harbor and the first week of March in the harbor.

HARBOR.—Nordiske Cable and Wire Wharf has a berth on its northern side and one on its eastern side. A small detached breakwater lies close off the eastern side of the wharf. A warping buoy is moored about 100 yards off the northern side of the wharf.

Hansens Havn is approached by a dredged channel that is marked by buoys and a pair of beacons in range 181°. The beacons stand on the western side of the basin and consist of red and white striped triangles. The basin off the wharf is very constricted.

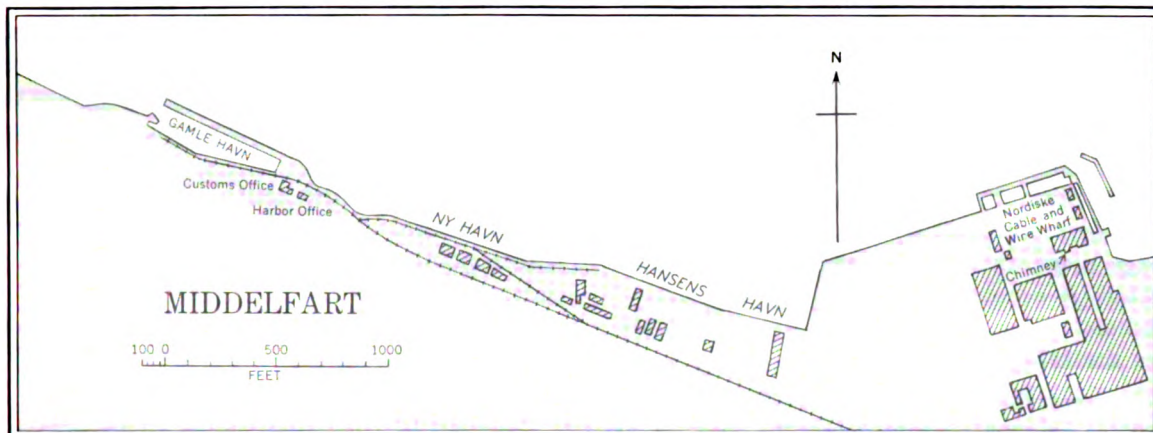
Ny Havn is bordered by a quay that has two berths and is fitted with a crane.

Gamle Havn consists of a narrow basin that is used by fishing vessels and small boats. It is about 200 yards long and has an entrance only about 65 feet wide.

A LIGHT is shown on the southern side of the entrance to Gamle Havn.

Pilots are available at Middelfart; they will take vessels to Assens and Aaro Sund.

Directions.—A vessel approaching Middelfart from westward and intending to enter Gamle Havn should stand in close enough to the shorebank to see the inner side of the outer mole. This will bring the vessel inside the northgoing current in Lille Bælt.



A vessel approaching from northward during a northgoing current should swing sharply as it enters the harbor.

3B-12 MIDDELFART, a town with a population of 9,057 (1965), is the northern terminus of rail and road communications between Fyn and Jylland. The manufacture of hardware, pottery, and foundry products are the main pursuits. Coal and lumber are the principal imports. The customhouse and harbor office are located near the head of Gamle Havn.

Nordiske Cable and Wire Wharf has a berthing length of 325 feet with a depth of 5.7 m (18.7 ft.) on the north side and a berthing length of about 250 feet with a depth of 4.0 m (13.1 ft.) on the east side.

Hansens Havn, where coal is handled, has a quay with a berthing length of about 250 feet and a depth of 4.0 m (13.1 ft.) alongside. There are depths of 5.2 m (17.0 ft.) in the approach. The quay is equipped with a movable crane with a capacity of 3 1/2 tons.

Ny Havn has a quay with two berths. One berth is about 650 feet in length with a depth of 6.6 m (21.6 ft.) alongside. The other berth is about 325 feet in length with a depth of 5.6 m (18.3 ft.). The quay is equipped with a 1 1/2-ton mobile crane.

Gamle Havn: The inner side of the mole in this basin is about 575 feet long and is quayed. The south and east sides are also quayed. There is a depth of 4.5 m (14.7 ft.) in the entrance and in the basin proper.

A marine railway with a lifting capacity of 150 tons is located in Gamle Havn. Repairs can be effected. Stores, provisions, coal, and water are available. The berths are connected with the general railroad system. There is regular steamer communication with København.

SNAEVRINGEN—NORTHERN PART (Continued)

3B-13 Kongebro Yacht Harbor, about 1/2 mile west-northwestward of Middelfart, is a small boat harbor consisting of two basins enclosed northward by a mole. Depths in the basin are 1.5 to 2.5 m (4.9 to 8.2 ft.) and 2.0 to 4.0 m (6.5 to 13.1 ft.) along the northern side of the mole. A light is occasionally shown from the molehead.

Gals Klint, a wooded headland about 85 feet high, lies about 1 1/2 miles west-northwestward of Middelfart. The north side of the point is steep-to; the fairway here narrows to a width of about 500 yards. An overhead cable with a clearance of 108 feet crosses the fairway at Gals Klint.

Lille Bælt Bridge spans Snævringen between Kongebro and Snoghøj. It is constructed on four piers, numbered I, II, III, and IV, and has three principal passages. The vertical clearance of the bridge is 108 feet.

A fog detector light, visible westward of the bridge only, is exhibited from Pier III.

The main channel leads between Piers II and III and has two-way traffic; it has a horizontal clearance of 689 feet between the piers.

The channel between Piers I and II is used only by eastbound traffic and has a horizontal clearance of 508 feet between the piers. The channel between Piers III and IV is used only by westbound traffic and has the same horizontal clearance as the latter channel.

The passages between the south shore and Pier I and between the north shore and Pier IV are open to two-way traffic.

Red and green guide lights are shown from the bridge piers and a white light is shown on each side of the bridge over the main channel. A fog signal is sounded from Pier III.

Regulations: Vessels that have negotiated the passage between the piers must give way to incoming vessels to enable them to set course toward the passage.

Anchoring, fishing, and cross-channel navigation within $\frac{1}{4}$ mile of the bridge is prohibited. Vessels are not permitted to secure to the bridge piers, and landing on the latter is prohibited.

Submarine cables are laid southeastward from the bridge.

Caution: With a southgoing current in the passage, the current sometimes sets sharply, as much as 33° , toward the longitudinal axis of the bridge piers from a southeasterly direction; with a northgoing current this occurs from a northwesterly direction.

Directions for the northern part of Snævringen.—From a position southward of Skanseodde (sec. 3B-7), vessels should steer round Strib Odde at a distance of at least $\frac{1}{4}$ mile and thence steer southward toward the chimney of the Nordiske Cable and Wire Factory. Thence vessels should round Lyngs Odde at a distance of about 700 yards, taking care to avoid the $28\frac{1}{2}$ -foot patch lying about $\frac{1}{4}$ mile southward of the point. From here, vessels should proceed through one of the passages under Lille Bælt Bridge and round Gals Klint to enter the southern part of Snævringen (sec. 3B-14).

At night the light sectors of Strib Odde Light and the four lights at the western end of the passage (sec. 3B-10) and also the guiding lights on the bridge serve to keep vessels in the middle of the fairway.

SNÆVRINGEN—SOUTHERN PART

3B-14 The southern part of Snævringen is defined in this volume as comprising the two remaining reaches of the passage between Gals Klint and Stenderup Hage. Fænø Sund and Gamborg Fjord are described herein; Kolding Fjord is described in section 3B-15.

This part of the passage becomes wider and has the greatest depths. The shorebanks are

steep-to except off Lødver Odde and off Stenderup Hage. Flessingen and a $25\frac{1}{2}$ -foot patch about $\frac{1}{2}$ mile eastward of Lødver Odde are the only detached dangers of concern to the mariner.

Northwestern and southwestern shores of this passage.—Børup Sand, the northern entrance point of Kolding Fjord, lies about $1\frac{1}{4}$ miles southwestward of Damgaard. Lødver Odde, the southern entrance point of Kolding Fjord, lies nearly 1 mile southwestward of Børup Sand.

Between Lødver Odde and Stenderup Hage, about $3\frac{1}{4}$ miles southeastward, the coast is fairly low and wooded. A conspicuous yellow cliff is located about $\frac{1}{2}$ mile northwestward of the latter point. The shorebank, as defined by the 5-fathom curve, for about $\frac{3}{4}$ mile southeastward from Lødver Odde extends up to about 400 yards offshore. An 8-foot rocky patch lies near the outer edge of this bank about midway along its length. The shorebank at Stenderup Hage extends nearly $\frac{1}{2}$ mile offshore and is marked by a buoy.

Eastern side of this passage.—The western side of Gals Klint is wooded and fronted by a shorebank that extends nearly $\frac{1}{4}$ mile offshore near the entrance to Fænø Sund.

Flessingen, a steep-to shoal close westward of Gals Klint, lies between the main fairway and the northern entrance of Fænø Sund. There is usually a least depth of 8 feet on this shoal but strong currents may form temporary patches with a depth of about 5 feet. This shoal is connected to Fænø to the southeastward and to Fænø Kalv to the south-southwestward. A buoy is moored in 16 feet on the central part of the shoal.

A detached 13-foot patch lies about $\frac{1}{2}$ mile northward of the shoalest part of Flessingen.

Fænø Kalv is a grass-covered islet, 39 feet high, that is steep-to on its western and southern sides.

Fænø divides this part of Lille Bælt into two passages; the main passage leads to the

westward of the island and Fænø Sund leads between the island and Fyn. The eastern and western sides of the island are fringed by a narrow and steep-to shorebank. On the southern side of the island the shorebank extends up to 400 yards offshore and is also steep-to. Two rocks that nearly dry lie on the latter shorebank.

The island has steep and cliffy coasts in most places and is wooded on the north and south ends. A mill stands atop a 128-foot hill in the middle of the island. A light is shown on the south side of Fænø.

Fænø Sund, a secondary channel with general depths of 6 to 15 fathoms, is free of detached dangers but somewhat constricted. It leads southward into Gamburg Fjord; one branch of the channel leads southward of Fænø to connect with the main passage of Lille Bælt.

A cable area is located in Faeno Sound extending in a west-southwesterly direction from the vicinity of Oksenerodde to the northwesterly shore of Faeno. Beacons and posts ashore mark submarine cables. A sewer outfall marked by a buoy discharges on the east side of the channel.

Gamburg Fjord, a continuation of Fænø Sund, recedes about 4 miles inland and is separated from Lille Bælt by the peninsula of Fønsskov. This inlet has general depths of 3 to 4 fathoms between the shorebanks. Fønsskov Odde, the northern extremity of the peninsula, has a steep-to reef extending about ¼ mile north-northeastward from it. The town of Ronæs is located at the head of the inlet. Local knowledge is essential for entering this inlet.

Anchorage.—There is anchorage in about 8½ fathoms in a position about ¼ mile north-northwestward of Fænø Kalv but care must be taken to clear Flessingen. Anchorage may also be taken in the entrance of Kolding Fjord in 7 to 9 fathoms (sec. 3B-15).

Prohibited Anchorage.—Anchoring is prohibited in an area extending from the southern end of the island of Faenø, southward for about 2 miles and bounded on the east and west by the coast line.

Directions for the southern part of Snævringen.—Traffic through the southern part of Snævringen generally uses the passage westward of Flessingen and Fænø Kalv. Passage through Fænø Sund requires local knowledge.

Vessels rounding Gals Klint (sec. 3B-13) should take care to avoid Flessingen and the 13-foot patch about ½ mile northward of the shoalest part of Flessingen. This can be done by steering for Børup Sand in range about 242° with Skarre Odde, about 2/3 mile westward of Lødver Odde, until Stenderup Hage bears about 161° and is just open of the western extremity of Fænø. At this time vessels should steer south-southwestward until abeam of Fænø Kalv. Thence vessels should steer southeastward in midchannel to a position eastward of Stenderup Hage.

At night the light sectors of Snoghøj Light, Børup North Light, Skærbæk Light (sec. 3B-15), and Fænø Light are helpful in navigating through this passage.

KOLDING FJORD AND KOLDING

Position: 55°29' N., 9°30' E.
Depths: Fjord entrance, 7 to 9 fathoms.
 Outer fjord, 5 to 7 fathoms.
 Skærbæk Wharf, 23 feet.
 Inner fjord, 23 feet.
 Harbor, 11 to 23 feet.
Tidal range: About 6 inches.
Port plan: See section 3B-16.

3B-15 Kolding Fjord is entered between Børup Sand and Lødver Odde (sec. 3B-14) and extends westward about 4½ miles to the port of Kolding. Gudsø Vig, a shallow bight, branches off from the fjord a short distance within the entrance. With the exception of the entrance the greater part of the fjord is shallow. A channel is dredged through the extensive bank that occupies the inner part of the fjord to allow access to the port.

Both sides of the fjord are fairly high and the terrain consists of woodland and cultivated fields. There is a fishing harbor at Skærbæk about ½ mile northwestward of Børup Sand. Skærbæk Works with wharf accommodations for an oceangoing vessel is located about ¾ mile westward of Børup Sand. There are several

isolated piers projecting from various places in the fjord.

Tides and water level.—The tidal range is only about 6 inches. Easterly winds raise the water level about $4\frac{1}{2}$ feet and westerly winds lower it about 3 feet.

Ice.—Kolding Fjord is one of the places in this area where ice makes its earliest appearance. Ice may form as early as the second week of November and remain as late as the first week of April. However, on the average, the first ice appears during the latter part of December and remains until the first part of March. An ice-breaker is available and the harbor is open to navigation even in severe winters.

Depths.—From the fjord entrance, where there are depths of 7 to 9 fathoms, toward the port the depths become progressively lesser. There is a least depth of 5 fathoms in the fairway as far as a position southward of Drejens Odde. From this position to the entrance of the dredged channel, about 1 mile westward of Drejens Odde, the depths decrease gradually to a least depth of 23 feet. In the dredged channel and in the turning basin in the harbor there is a depth of 23 feet. The outer harbor has depths of 11 to 23 feet and the inner harbor has depths of 16 to 23 feet.

A spoil ground is located in the inner fjord, on the northern side of the channel, just outside the harbor entrance.

The fishing harbor at Skærbæk has depths of 8 to 9 feet. A channel dredged to a depth of $24\frac{1}{2}$ feet leads from the deeper water in the fjord entrance to the turning basin off Skærbæk Wharf. The turning basin has a depth of 23 feet.

Gudsø Vig has general depths of less than 3 feet. In the narrow channel leading into this bight there are depths of $6\frac{1}{2}$ to 17 feet.

Outer fjord.—The outer fjord comprises that part of this inlet that lies between Børup Sand and Drejens Odde, about 2 miles west-southwestward, and includes Gudsø Vig.

Although there are ample depths in the entrance the remainder of the fjord is encumbered with extensive shorebanks. The narrow channel that leads to the head of the fjord is entered about $\frac{1}{2}$ -mile south-southwestward of

Skærbæk Wharf; a **fairway buoy** is moored in this position. **Buoys and light buoys** in accordance with the uniform system mark the channel to the port.

Lights are shown at Skærbæk Wharf and at Drejens Odde; a **light beacon** stands on the mole in the entrance of the fishing harbor at Skærbæk.

The dredged channel to Skærbæk Wharf is about 180 feet wide and the basin off the wharf is 765 feet wide at its northern side. **Skærbæk Wharf** is 700 feet long and has a depth of 23 feet alongside. The channel and basin are marked with **buoys**; a **mooring buoy** is located in the basin.

An oil pier, with 4 dolphins extending up to 475 feet south-southeastward and north-northwestward of the head, is located close eastward of Skaerbaek Wharf. A dredged channel, with a depth of 36 feet and a bottom width of 260 feet, leads from southeastward to the oil pier. A light buoy marks the eastern side of the entrance to the buoyed dredged channel. A lighted range marks the channel.

The fishing harbor of Skærbæk consists of a small basin formed by two moles. There is a least depth of 9 feet in the entrance to the harbor and depths of 8 to 9 feet alongside the berths in the basin. The entrance is narrow and the harbor is suitable only for small vessels.

Gudsø Vig occupies the head of the indentation between Skærbæk Wharf and Drejens Odde. Two small islets stand in the shoal water about $\frac{2}{3}$ -mile westward of Skærbæk Wharf. A **buoy** is moored in a depth of about 10 feet in a position about $\frac{1}{2}$ -mile west-southwestward of Skærbæk Wharf.

A **submarine cable** is laid southward across Kolding Fjord from a position about $\frac{1}{4}$ mile westward of Skaerbaek Wharf. **Lighted range beacons** on the northern shore indicate the direction of the cable.

At Lødver Odde, on the southern side of the fjord, there is a pier with a depth of 8 feet at its head.

A buoy is moored in a depth of about 10 feet a short distance northeastward of Skarre Odde.

Agtrup Vig is a recession in the coast between Skarre Odde and Løger Odde, about $1\frac{1}{4}$ miles west-southwestward; here the channel follows a winding course but is well indicated with bouys.

Inner fjord.—The inner fjord lies between Drejens Odde and the harbor entrance and is a straight reach about 3 miles long. There are general depths of 6 to 12 feet westward of Løger Odde.

The dredged channel is nearly 2 miles long and is over 100 feet wide. It leads to the harbor in two reaches. The long inner reach is indicated by a pair of light beacons in range 267° that stand in the harbor. Lighted bouys mark the outer reach of the channel and include a red and white striped buoy $\frac{1}{4}$ mile southward of Drejens Odde. Lights are also shown at the entrance of the harbor.

The town stands out prominently. Julemærke Sanatorium is located on the north shore nearly 1 mile westward of Drejens Odde. Strandhuse is located about $2\frac{1}{4}$ miles westward of Drejens Odde.

Harbor.—The harbor consists of two artificial basins. The outer basin is protected by two breakwaters and is used as a turning basin for larger vessels. The inner basin consists of an outer harbor and an inner harbor, both of which are almost entirely quayed. A spur projecting from the southern side of the harbor separates superficially the outer basin from the inner basin.

The outer basin has a minimum swinging width of about 800 feet over a dredged depth of 23 feet.

The area northward of the turning basin, within the elbow of the northern breakwater, is reserved for yachts and fishing craft, and has depths of 5 to 10 feet.

Kolding Aa discharges into the fjord immediately southward of the harbor.

Anchorage.—There is good anchorage in the fjord entrance in 7 to 9 fathoms, mud and clay bottom, in a position about midway between

Børup Sand and Lødver Odde. Small vessels can anchor in 13 to $19\frac{1}{2}$ feet on the shorebank west-southwestward of Skærbæk Wharf.

Regulations.—The special regulations for navigating in Danish inland waters (sec. 1-39) apply to navigation in Kolding Fjord, with the following addition.

During ice conditions in the fjord, vessels must abide by the instructions given by the harbormaster, and also the special instructions which may be published in the Notices to Mariners.

Pilotage.—There is a pilot station at Skaerbaek where the pilot boats are stationed in the fishing harbor. Pilots will take vessels to Kolding and also to all places in Lille Bælt, Svendborg Sund, and Kieler Förde.

Directions.—Vessels bound for Kolding from northward should steer to pass close southward of Børup Sand. After passing this point, vessels should steer through the center of the fairway as far as the fairway buoy, taking care to remain northward of the buoy. Børup Sand in range 069° with Gals Klint, seen over the stern, leads through the center of the fairway. From the fairway buoy vessels should employ a pilot through the narrow winding channel to the port.

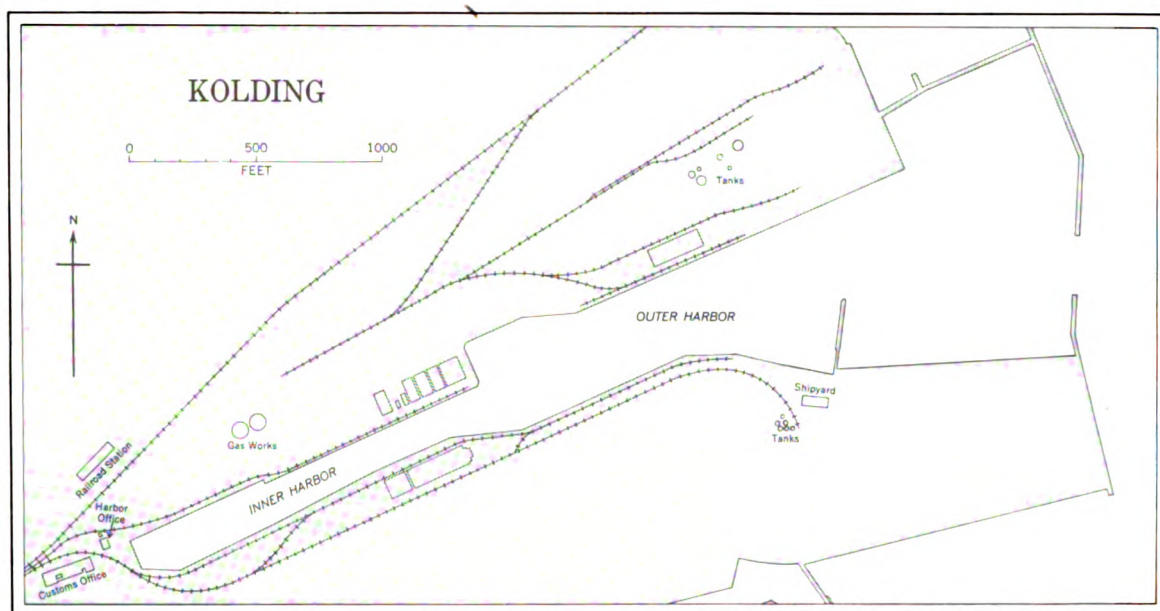
3B-16 KOLDING is a commercial and light industrial center with a population of about 37,093. The principal industries are food processing and the manufacture of cement and machinery. Coal, fertilizer, fodderstuffs, and grain are the chief imports. The customhouse and the harbormaster's office are located at the head of the inner harbor.

Outer harbor: The northern side of this harbor is about 2,000 feet in length, of which there is an unbroken length of about 1,500 feet with depths of $19\frac{1}{2}$ to 23 feet alongside; the western end has depths alongside of 15 to 18 feet. The southern side of the harbor westward of the spur has a quay 450 feet long with a depth of $19\frac{1}{2}$ feet alongside, thence 1,000 feet of quaying with 23 feet alongside.

Inner harbor: On the north side of this harbor there are two berths; one has a berthing length of about 1,000 feet with depths of $19\frac{1}{2}$ to 23 feet alongside and the other has a berthing length of about 650 feet with a depth of $16\frac{1}{2}$ feet alongside. The south side of the harbor has a berthing length of about 1,700 feet with depths of 19 to 23 feet alongside.

The berths in both harbors are served by the railroad. There are two $2\frac{1}{2}$ -ton cranes, one 4-ton traveling crane, and one $4\frac{1}{2}$ -ton fixed crane.

Provisions, coal, fuel oil, and water are available. A small shipyard is located in the harbor. An icebreaker and a tug are stationed in Kolding.



There are several hospitals in the town. Kolding is a railroad junction and is connected with the general railroad system. It is also connected to the general communication system of Denmark.

ANCHORAGES

3B-17 Fredericia.—See section 3B-8.

Lyngs Odde.—See section 3B-10.

Off Damgaard.—See section 3B-10.

Strib Havn.—See section 3B-10.

Fænsø Kalv.—See section 3B-14.

Kolding Fjord.—See section 3B-15.

Part C. CENTRAL PART OF LILLE BÆLT

3C-1 Stenderup Hage ($55^{\circ}28' N., 9^{\circ}42' E.$) and **Fønsskov** form not only the southern entrance to Snævringen but also the northern entrance to the central part of Lille Bælt. These features are described in sections 3B-14 and 3C-7.

GENERAL

3C-2 The central part of Lille Bælt as defined in this volume has Snævringen as its northern boundary. The southern limit of this area lies between Lindehoved on the east and

Halk Hoved on the west. Lindehoved is located on the peninsula of Helnæs in a position about 22 miles south-southeastward of Fønsskov Odde. Halk Hoved is located on Jylland in a position nearly 16 miles southward of Stenderup Hage.

The northern part of this area is known as Bredningen, a spacious roadstead lying, in general, between the southern entrance to Snævringen and the island of Brandsø. Southward of Brandsø, Lille Bælt is encumbered by extensive shoals on which stand several islands and islets, of which Baagø and Aarø are the largest. Three channels pass through this shoal area. Baagø Sund, the deepest and the most extensively used channel, leads between Fyn and Baagø. Aarø Sund, the western channel, leads between Aarø and Jylland. Fyr Renden, the central channel, leads between Baagø and Aarø.

Southward of Aarø, Lille Bælt broadens considerably and becomes deeper.

Both shores of this part of Lille Bælt trend irregularly to form a number of bights of little commercial significance. On the eastern shore the bights are separated by prominent but

fairly low peninsulas whereas on the western shore the bights, although not as recessive, are separated by steep headlands. Haderslev Fjord, a narrow inlet about 7 miles long, indents the coast of Jylland about 4 miles south-southwestward of Brandsø.

The terrain is characterized by rolling country, isolated hills, farmland, and wooded areas. Skamlingsbanken, a 371-foot summit of a ridge of hills, is the highest elevation in this area. It is located about 5 miles southwestward of Stenderup Hage and has a monument standing on it. There are several prominent churches standing at various places on either side of this body of water.

Lights are shown on Fyn for guidance through Baagø Sund and the channel southward of Baagø. Lights are also shown at the ports of Assens and Aarø Sund and on the islands of Baagø and Aarø. The three channels are marked with buoys.

The main port in this area is Haderslev, located at the head of Haderslev Fjord. Assens, a minor port, is located on Fyn southeastward of Baagø. There is a small harbor at Aarø Sund located on Jylland just westward of Aarø.

DEPTHS AND DANGERS

3C-3 Bredningen has general depths of 3 to over 10 fathoms. The shorebank, as defined by the 3-fathom curve, lies less than 1 mile offshore and in most places lies less than $\frac{1}{2}$ mile offshore. Other than Flækøjet and the dangers fringing Brandsø, there are no dangers in this roadstead.

Flækøjet, a steep-to shoal area with a least depth of $13\frac{1}{2}$ feet, lies detached in the northern entrance to Bredningen about 1 mile southward of Stenderup Hage. A **buoy** is moored at the eastern end of this shoal.

Baagø Sund and the channel southward of Baagø have a least depth of 39 feet. **Fyr Renden** has a least depth of about 20 feet. **Aarø Sund** has a least depth of about 31 feet.

The dangers between these channels and those surrounding the islands of Aarø and Baagø are described with those features.

Southward of Aarø Sund the depths increase to over 10 fathoms. The shorebank, as defined by the 6-fathom curve, lies only about $\frac{2}{3}$ mile off Halk Hoved, but off the eastern shore the shorebank trends very irregularly and there are a number of detached dangers lying up to $3\frac{3}{4}$ miles offshore. Nordlige Lillegrund, the outermost of the latter dangers, has a least depth of $3\frac{1}{2}$ fathoms located about $3\frac{1}{4}$ miles south-eastward of Aarø.

The channel leading to the port of Haderslev has a least depth of 21 feet. The approach to the port of Assens has a least depth of 21 feet.

WATER LEVEL

3C-4 See section 3-2.

CURRENTS

3C-5 See section 3-3.

ICE

3C-6 See section 3-4.

BREDNINGEN

3C-7 This part of Lille Bælt has convenient depths for **anchoring** throughout its greater part and the holding ground is good. The channel of Lille Bælt leads eastward of Flækøjet and Brandsø as the water is deeper here than elsewhere. The bottom in this channel is sand, with mud on either side, and mud over clay toward the Jylland coast.

Eastern shore of Bredningen.—Off the west side of Fønsskov, between Fønsskov Odde and Tønnæs Odde, about $2\frac{1}{2}$ miles south-southeastward, the shorebank extends up to $\frac{1}{2}$ mile offshore and is very steep-to. Tønnæs Odde rises steeply as a small bare cliff.

Between Tønnæs Odde and Wedellsborg Hoved, about 4 miles south-southeastward, there are two bights that are separated by a

prominent peninsula. A steep-to shorebank fronts the peninsula nearly 1 mile. Fons Vig, the northern indentation, affords good anchorage, free of the current, in about 6 1/4 fathoms, oozy bottom. Tybrind Vig, the other bight, also affords good anchorage, clear of the current, but the shorebank, as defined by the 3-fathom curve, occupies the greater part of the bight.

The prominent landmarks are Sparretorn Skov and Sparretorn Manor House, on the northern side of Fons Vig; Fons Church, at the head of the bight; and Udby Church, about 3/4 mile farther northeastward. Husby Church, about 2 3/4 miles eastward of Wedellsborg Hoved, is also conspicuous. Most of the churches in this part of Lille Bælt are painted white and have red roofs.

Wedellsborg Hoved is fronted by a shorebank up to about 1/2 mile offshore. A buoy is moored off the southwestern end of this shoal area. A wreck lies sunk in 9 1/4 fathoms about 2/3 mile westward of the southwestern end of the peninsula.

A submarine cable is laid between Wedellsborg Hoved and Brandso. The landing place at each terminal is marked with a pair of beacons.

WESTERN SHORE OF BREDNINGEN.—Between Stenderup Hage and Anslet Hage, nearly 7 1/2 miles south-southwestward, the coast recedes to form two bights. The depths are everywhere less than 6 fathoms. The shorebank, as defined by the 3-fathom curve, lies within about 2/3 mile offshore except at Anslet Hage, where it extends nearly 1 mile offshore.

Mosvig is a bight that occupies the head of the indentation between Stenderup Hage and Vargaard Hoved, a steep yellow cliff located nearly 5 miles southwestward. There is anchorage in 4 to 4 1/2 fathoms, mud and ooze, in Mosvig. Vejstrup Church, located about 2 1/2 miles inland from the head of the bight, has a spire and is a prominent landmark.

Hejelsminde Bugt lies between Vargaard Hoved and Anslet Hage. At the head of the

bay there is a shallow lake that is entered by means of a short narrow channel that is marked with poles. There are several tile-works northeastward of the lake entrance and a large tile works close southward of the lake entrance. Anchorage can be taken in about 4 1/2 fathoms, mud, about 600 yards offshore southeastward of the northern tile works.

A wreck lies in 6 fathoms about 2 miles east-southeastward of Vargaard Hoved.

A buoy is moored in a depth of 6 1/2 fathoms off the shorebank at Anslet Hage in a position about 1 mile eastward of the point.

BRANDSO lies about midway between Wedellsborg Hoved and Anslet Hage. It is low, rising only to a height of 23 feet in its northern part and 26 feet in its southern part, and is wooded in its northern part. A shorebank, as defined by the 3-fathom curve, surrounds the island up to 1/2 mile offshore; the eastern and southern sides are very steep-to. A reef on which are some drying rocks extends nearly 1/2 mile north-northeastward from the island, and there are a number of stones on the shorebank eastward and southward of the island.

A hard with a pier at its outer end extends from the southeastern side of Brandso. The pier has a depth of 8 feet at its head. For small vessels, there is good anchorage in 19 1/2 feet southeastward of the pier.

DIRECTIONS THROUGH BREDNINGEN.—From a position eastward of Stenderup Hage (sec. 3B-14), vessels should proceed midway between Flaekojet and the shorebank fronting Tonnaes Odde and thence continue southward to a position nearly 1 mile westward of the southwestern end of Wedellsborg Hoved.

BAAGO SUND AND MAIN CHANNEL

3C-8 Baago Sund and its southwesterly continuation is negotiated in three reaches between Bredningen and the open water eastward of Halk Hoved. The channel leads

between the dangers fronting the Fyn coast between Wedellsborg Hoved and Sonderby Klint, nearly 10 miles south-southeastward, on the east, and the dangers extending from the northern, eastern, and southern sides of Baago and those extending from the southeastern and southern sides of Aaro, on the west.

The southeastern approach to the main channel between Sonderby Klint and Lindehoved, on Helnaes, is described in section 3C-14.

BAAGO SUND, comprising the southeastern and southern reaches of the main channel, lies between Baago and Fyn and has depths of 7 to 12 fathoms in the fairway. The shorebank, as defined by the 6-fathom curve, follows the Fyn coast at a distance of about 1/4 mile offshore except in the bight 3 miles east-southeastward of Wedellsborg Hoved where it lies nearly 1 mile offshore. The shorebank off the northeastern side of Baago is nearly 1/2 mile wide, but the northern and eastern sides of the island are fronted by shoals to a distance of nearly 1 mile. The small islet of Egholm lies close off the northwestern end of Baago.

BAAGO is a low island with the town of Baago located in about its center. A small church with a low square steeple and a spire stands in the town. There is a small fishing harbor on the southern side of the island. Lights (sec. 3C-10) are shown on the southwestern end of the island.

NAVIGATIONAL AIDS.—A light with sector guidance through the southeastern reach of the channel is located at Tvingsbjerg nearly 5 miles southeastward of Wedellsborg Hoved. A pair of lights in range 160 1/2° for guidance in the southern reach in the channel are shown in the harbor of Assens. Other lights are also shown in the harbor of Assens.

Three buoys are moored near the edge of the dangers on the western side of the channel; the northernmost buoy lies about 1/2

mile northward of the northeastern end of Baago.

The following are prominent landmarks: Tangerup Church, with its steeple visible, located about 4 miles eastward of Wedellsborg Hoved; Sandager Church located a little over 11/2 miles northeastward of Tvingsbjerg; Barlose Church standing on the fairly high ground nearly 3 miles east-northeastward of Tvingsbjerg; Hølevad Church lying nearly 2 miles eastward of Tvingsbjerg; and the building and tall chimneys in the town of Assens.

There is a small pier on the coast about 1 mile east-southeastward of Wedellsborg Hoved.

The approach to the port of Assens lies on the southeastern side of the southern reach of the channel. This approach and the port of Assens are described in section 3C-9.

SOUTHWESTERN REACH OF THE MAIN CHANNEL.—This part of the channel is about 6 1/2 miles long between its northern end and a position about 13/4 miles southward of Aaro. There is a least depth of 6 1/2 fathoms in the indicated fairway and the width of the channel is about 400 yards in its narrowest part. Fyr Renden (sec. 3C-10) leads into the narrowest part of the channel in a position about 12/3 miles southeastward of the southwestern end of Baago.

The western side of this channel is formed by the extensive shoal area lying between Baago and Aaro and fronting the southern and southeastern sides of these two islands. The 6-fathom curve that contains these shoals trends rather regularly southwestward from a position a little over 1 mile eastward of the southeastern end of Baago to a position nearly 1 1/2 miles southward of Aaro.

The island of Aaro is low, being only 26 feet high in its northern part, and has a settlement, with a church, near its western side. Aaro Kalv, an irregularly shaped peninsula, extends about 1 mile northeastward from the southeastern end of the island. The western side of Aaro is described in section 3C-11.

Between Aaro and Baago there are three small islets, the largest of which is named

Bastholm. A submarine cable is laid between Aaro and Baago. The landing place on Aaro is marked with a pair of beacons and the landing place on Baago is marked with a pair of light beacons.

The eastern side of this channel is formed by the shorebank extending from the coast close northward of the port of Assens to Sonderby Klint. This shorebank lies about 1 1/4 miles northwestward of the port of Assens and nearly 2 miles westward of Toro. Several detached dangers with depths of less than 6 fathoms lie within 4 1/4 miles westward and 3 miles southwestward of Sonderby Klint. Nordlige Lillegrund, the outermost detached danger, lies with its shoalest part, 3 1/2 fathoms, about 3 2/3 miles westward of Sonderby Klint.

Several submarine cables are laid between Baago and the Fyn coast nearly 3/4 mile northward of Assens. The landing place of each terminal is marked with a pair of beacons.

The islet of Toro lies about 2/3 mile southward of Assens and is small and flat. Beacons on the islet indicate the landing places of two submarine cables laid to the coast of Fyn.

Sonderby Klint, a steep bare point rising to a height of 148 feet, lies about 2 miles southeastward of Toro.

NAVIGATIONAL AIDS.—The fairway in the southwestern reach of the channel is indicated by a pair of lights in range 042°. The front light is shown from the same structure as Tvingsbjerg Light, described above, and the lights are over 1 mile apart.

The western side of the channel is marked with two buoys, one of which is a lighted bell buoy and the other has a radar reflector. The eastern side of the channel is marked by three buoys. A spar buoy moored nearly 1 1/4 miles west-northwestward of Toro does not indicate the edge of the channel.

DIRECTIONS for Baago Sund and the main channel.—Mariners are advised that good

visibility is a prerequisite for safe navigation through this channel. The passage should not be attempted when visibility is less than 4 miles. Furthermore, the positions of the buoys should be regarded with caution as they are apt to shift.

From a position westward of Wedellsborg Hoved (sec. 3C-7), vessels should proceed through Baago Sund by steering about 124° for Tvingsbjerg light structure until the light structures in the harbor of Assens are in range 160 1/2°. Thence vessels should steer on this alinement until Tvingsbjerg range light structures are in line 042°. At this position vessels should make a sharp turn to the southwestward and steer with Tvingsbjerg light structures in range 042°, astern, to a position about 1 3/4 miles southward of Aaro. In making the latter turn, vessels should take care not to set down on the shoals extending north-northwestward from Assens.

ASSENS

Position: 55° 16' N., 9° 53' E.
 Depths: Approach and dredged channel, 7.0 m (22.9 ft.).
 Harbor, 2.5 to 7.0 m (8.2 to 22.9 ft.).
 Tidal range: Negligible.

3C-9 The port of Assens lies in a small coastal indentation that is formed by a peninsula extending northward. The harbor is approached from the southern side of Baago Sund through a channel dredged through the shoals fronting the area. The artificial basins that comprise the harbor are further sheltered by a breakwater extending northward from the peninsula. The town of Assens lies adjacent to the port.

WATER LEVEL.—Gales from the northeast and east following westerly winds may raise the water as much as 5 feet, and gales from the (continued on page 157)

southwest to northwest may lower it a like amount.

Ice.—In the vicinity of Assens, ice may form as early as the last week of December and remain as late as the second week of April. On the average, however, ice first appears about the third week of January and disintegrates about the middle of March.

Harbor approach and roadstead.—Asnæs Rev, a shoal area with depths of less than 10 feet, extends about $\frac{3}{4}$ mile northwestward from the peninsula. A spar buoy with a radar reflector is moored at the northern end of this shoal.

Small vessels with local knowledge can anchor in the roadstead in about $3\frac{1}{2}$ fathoms abreast a large farmhouse surrounded by trees. The anchorage is sheltered by all except northerly winds and the holding ground is fairly good. Northerly winds may raise a sea here.

A channel dredged to a depth of 23 feet over a width of about 100 feet leads from the roadstead to the harbor entrance. A pair of light beacons in range $171\frac{1}{2}^{\circ}$ is located in the southern part of the harbor and indicates the fairway in the dredged channel. The beacons are lighted only when a vessel is expected.

A light is shown on the head of the breakwater. Another light is shown on the head of the mole that separates the north harbor from the middle harbor.

Harbor.—The harbor consists of four basins and a turning area. The turning area lies between the breakwater and the entrance to the north harbor and has a swinging space of about 400 feet with a dredged depth of 23 feet. Two warping buoys are located in this area.

The north harbor is the only basin of commercial significance to larger vessels. The entrance to this basin is about 100 feet wide and has a depth of 23 feet. The southern and eastern sides of the basin are quayed for berthage and there are three dolphins on the northwestern side of the harbor.

The middle harbor is separated from the north harbor by a mole. This basin has a depth of $16\frac{1}{2}$ feet, is narrow, and has at its head a slip for the Assens-Aarøsund ferry. This basin can accommodate small vessels.

The south harbor is a quadrangular-shaped basin that is entered through the middle harbor. It has depths of $11\frac{1}{2}$ to 13 feet and is used by small craft and lighters.

The boat harbor lies southward of the south harbor. It is approached through a channel with a least depth of 8 feet that leads southward from the turning area. This basin has a depth of 8 feet.

Pilots are available at the harbor. They will also take vessels through Lille Baelt, northward and southward, and through the fairway southward of Fyn.

Directions.—Vessels should approach Assens from the northward on the range ($160\frac{1}{2}^{\circ}$) that indicates the southern fairway in Baagø Sund. A continuation of this course will lead to the harbor entrance in a depth of $16\frac{1}{2}$ feet. Vessels requiring greater depths should approach the harbor on the range ($171\frac{1}{2}^{\circ}$) that leads through the dredged channel. This range may be picked up at a position close off the shorebank southwestward of Tvingsbjerg.

ASSENS.—The town of Assens has a population of 5,012 (1955). It is situated in an area of productive land and is an important trading center of agricultural products and supplies. The trade is predominantly coastwise. Coal, coke, timber, and fertilizer are the main imports. There is a sugar refinery, meat packing plant, and an iron foundry in the town. The custom and harbor offices are located near the foot of the middle harbor.

In the north harbor the quay on the south side has a berthing length of about 450 feet and the quay along the east side has a berthing length of about 500 feet; the depths alongside both quays are dredged to 23 feet. Both quays are served by the railroad.

A 3-ton crane stands on the south side of the middle harbor.

Provisions, water, and coal are available. There is a small marine railway in the south harbor that can accommodate vessels up to 450 tons deadweight; the cradle length is 138 feet, draft forward is 10 feet, and draft aft is 15 feet. Minor repairs can be effected. A tug is available.

The town is connected to the general railroad and telegraph system.

FYR RENDEN

3C-10 Fyr Renden, a narrow and tortuous channel with a least depth of $3\frac{1}{4}$ fathoms, lies close off the southwestern side of Baagø. The channel is entered about 1 mile westward of Egholm and leads in a general southeasterly direction for about 4 miles to the southwestern reach of the main channel (sec. 3C-8). The passage is about 300 yards wide in its narrowest part, and it is used only by small vessels.

The **northern entrance** to this channel has depths of $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms. It lies between the shoals extending nearly $\frac{3}{4}$ mile westward from Egholm and a detached 3-fathom stony patch lying nearly $\frac{3}{4}$ mile farther west-southwestward. The 3-fathom patch is marked on its western side by a **buoy**.

The **eastern side of the channel** is formed by the shorebank, as defined by the 3-fathom curve, that fronts the west side of Baagø about $\frac{1}{4}$ mile and extends from the south side of the island to the main channel.

The **west side of the channel** is formed by the extensive shoal area that extends eastward and northeastward from Aarø; Bastholm, two other small islets, and a sand cay stand on this shoal area.

Navigational aids.—Three buoys are moored on the western side of the channel and one buoy is moored on the eastern side of the channel. The four buoys, three of which have radar reflectors, are all moored within a distance of 1 mile of the southwestern end of Baagø. Baagø Light and the submarine cable light beacons are shown on the southwestern end of Baagø.

Abnormal magnetic variation has been reported to exist in a position about 1 mile southwestward of Egholm.

Directions.—Local knowledge is essential to navigate this channel without a pilot.

Vessels approaching the channel from a position between Brandsø and Wedellsborg Hoved should steer south-southeastward for a position about $\frac{1}{2}$ mile westward of Baagø Light. At

this position Kærums Church, located about 2 miles east-southeastward of Assens harbor, bears 113° and is seen between Assens Church and the chimney of the sugar refinery. Vessels should steer for Kærums Church on this bearing (113°) until Baagø Church comes in range 347° with the southernmost farmhouse, with a red roof, in the town of Baagø. With the latter range over the stern, vessels should steer southward until the Tvingsbjerg Lights are in range 042° .

AARØ SUND AND APPROACHES

3C-11 Aarø Sund, the westernmost channel through the extensive shoal area in the central part of Lille Bælt, is available to vessels of moderate draft. The channel is entered about 2 miles southward of the eastern end of Brandsø and leads about 7 miles to the deep water northeastward of Halk Hoved. It has general depths of about 5 to 13 fathoms and follows an intricate course between Linderum and Aarø, where it is very narrow, and thence between Aarø and Jylland.

The water level in the channel varies with the locality. In the harbor of Aarø Sund, northeast winds raise the water level about $3\frac{1}{4}$ feet and southwest winds lower it about 2 feet. However, at the pier on the west side of Aarø, northeast winds raise the water level about 5 feet and northwest winds lower it the same amount. The tidal range at Aarø Sund harbor is about 2 feet.

Haderslev Fjord, which is described in section 3C-12, is approached from the northward and southward through Aarø Sund.

Northern part of Aarø Sund.—The coast between Anslet Hage (sec. 3C-7) and Ørby Hage, about $3\frac{1}{2}$ miles south-southeastward, is fronted by a shorebank, with depths of 3 fathoms and less, up to about 1 mile offshore. Off Ørby Hage, the northern entrance point of Haderslev Fjord, this shorebank extends about 2 miles offshore and surrounds the islet of Linderum.

Seaward of this shorebank there are depths of $3\frac{1}{4}$ to 6 fathoms except for Røde Grund and the deeper water in the channel of Aarø Sund.

Knudshoved, 50 feet high, is a prominent wooded point located about $\frac{3}{4}$ mile southward of Anslet Hage. Southward of the point the coast becomes lower but the land inland becomes high and is wooded in places.

A detached 19-foot patch lies about $1\frac{1}{4}$ miles east-northeastward of Knudshoved. The bottom on this patch is stone and gravel.

Rode Grund, a detached stony patch with a least depth of 4.8 m (15.7 ft.), lies about $2\frac{1}{2}$ miles southward of the eastern end of Brandso. A buoy is moored in a depth of about 5.1 m (27.8 ft.) on the southeastern side of the patch.

Linderum is the small islet lying on the western side of the channel about 1 mile north-northwestward of Aarø. The shorebank off the eastern and southern sides of the islet is steep-to and forms the western side of the channel of Aarø Sund. Buoys marking the fairway of Aarø Sund are moored on the southeastern and southern edges of the shorebank; the buoys off the southeastern side are moored in depths of 4.8 to 5.7 m (26.2 to 31.1 ft.) and the buoy off the southern side is moored in a depth of 36 feet and also marks the entrance to the channel leading to Haderslev Fjord.

A buoy moored about $\frac{2}{3}$ mile northwestward of Linderum marks the northern entrance to a shallow channel that leads westward of Linderum.

Bardenfleths Grund is the northern extremity of the shorebank that extends nearly $1\frac{3}{4}$ miles northward from Aarø and forms the eastern side of the channel of Aarø Sund. This shoal has a least depth of 2.1 m (6.8 ft.) and is marked on its northwest side by a buoy moored in a depth of about 28 feet.

Buoys.—Several buoys with radar reflectors, are moored on the south side of a 3.9 m (12.7 ft.) channel that leads from Fyr Renden to Aaro Sund.

A buoy with a radar reflector is moored on the east side of the channel in a depth of about 10.5 m (34.4 ft.) about $\frac{3}{4}$ mile eastward of Linderum.

The shorebank off the northwest side of Aaro is marked by two buoys moored in depths of about 8.5 and 9.0 m (27.8 and 29.5 ft.) one of these buoys has a radar reflector.

The channel in the northern part of Aarø Sund is entered close westward of the detached 3-fathom stony patch lying about $1\frac{1}{2}$ miles westward of Egholm (sec. 3C-8) and leads southward between Røde Grund and Bardenfleths Grund and thence southwestward between Linderum and Aarø.

Southern part of Aarø Sund.—The harbor of Aarø Sund lies on the west of the channel opposite the island of Aarø. It consists of a small enclosed basin, with a depth of 2.5 m (8.2 ft.) in its outer part, and a ferry slip close southward of the basin. The harbor is used only by small craft and small vessels. Pilots are available. A light is shown at the entrance to the harbor.

The coast between Aarø Sund harbor and Stagodde, about $2\frac{1}{4}$ miles northwestward, is fronted by a shorebank that extends up to $\frac{2}{3}$ mile offshore. The eastern side of this shorebank forms part of the western side of the main channel of Aarø Sund. A buoy moored about $\frac{3}{8}$ mile northward of the harbor of Aarø Sund marks the edge of the channel.

Between the harbor of Aarø Sund and Halk Hoved, about 4 miles southward, the 6-fathom curve that marks the edge of the channel lies less than 1 mile offshore; in the narrows between Aarø and Jylland it lies less than 200 yards off the Jylland coast. Raade Hoved, a steep bare point 39 feet high, lies nearly $1\frac{1}{2}$ miles southward of the harbor of Aarø Sund. The coast farther southward is low.

The west side of Aarø and the shorebank that extends nearly $1\frac{1}{2}$ miles southward from the island form the east side of Aarø Sund. There

is a small pier with a depth of 2.0 m (6.5 ft.) at its head in the small bight on the western side of the island; a breakwater shelters the pier.

A light is shown from the western side of Aarø. A light is shown, respectively, from the head of the above-mentioned pier and breakwater.

Buoys mark the shorebanks on both sides of the channel in the southern part of Aarø Sund.

Submarine cables cross Aarø Sund between a position southward of Aarø Sund harbor and Aarø; **beacons** mark the landing places on each shore.

Pilots for Aarø Sund and other places in Lille Bælt are stationed at Aarø.

Directions.—Local knowledge is essential to negotiate Aarø Sund. Mariners are advised to navigate with great caution through this channel because the fairway is quite narrow and the turns are sharp. Furthermore, the currents, which may set strongly between Linderum and Aarø and in the narrow parts of the fairway, do not always follow the direction of the channel.

From a position about $\frac{1}{2}$ mile eastward of Brandsø, vessels should steer southward to pass westward of the buoy marking the 3-fathom patch westward of Egholm and thence between the buoys marking Røde Grund and Bardenfleths Grund. Raade Hoved bearing 188° leads between the latter two patches. When the northern extremity of Aarø Kalv bears 136° , vessels should steer south-southeastward until Raade Hoved bears 192° and thence steer in on this bearing. When Baagø Light bears 070° vessels should alter course to the southwestward and continue on this course until the western extremity of Linderum is in range 349° with the western extremity of Brandsø. On this south-westerly course vessels must take care not to set on the shoals northwestward of Aarø.

With the 349° range seen over the stern vessels should steer south-southeastward into the open water southward of Aarø, being careful to avoid the shorebank extending from the Jylland coast.

HADERSLEV FJORD AND HADERSLEV

Position: $55^\circ 15' N., 9^\circ 30' E.$
Depths: Approaches, 6.4 to 13.7 m (3.5 to 7.5 fm).
 Dredged channel, 6.5 m (21.3 ft.).
 Harbor, 1.5 to 6.5 m (4.9 to 21.3 ft.).
Tidal range: Negligible.
Port plan: See section 3C-13.

3C-12 Haderslev Fjord, entered between Ørby Hage and Stagodde, is a narrow and winding inlet about 7 miles long. The port and town of Haderslev lie at the head of the fjord and are approached through a channel dredged along the entire length of the inlet. The fjord is too narrow and shallow for anchoring, being nowhere $\frac{1}{2}$ mile in width or more than $6\frac{1}{2}$ feet in depth except in the dredged channel. At the head of the harbor there is a dam that separates a large lake from the fjord.

Tides and water level.—The mean tidal range is slight, being only about 6 inches. Easterly winds may raise the water level about $4\frac{1}{4}$ feet and westerly winds may lower it about the same amount.

Ice.—The average date of the first appearance of ice in the fjord is the first week of January, although ice may appear as early as the first week of November. The ice may disintegrate as early as the first part of February and as late as the first part of April but the average date is the first week of March. Navigation is generally open the year around and ice-breakers are used when necessary.

Depths.—In the approach to Haderslev Fjord between Aarø Sund and the dredged channel there are general depths of 21 to 45 feet between the shorebanks on either side of the channel. A channel dredged to a depth of 21 feet over a bottom width of 85 feet leads from the fjord entrance to the harbor; otherwise the fjord is very shallow. In the harbor and alongside the quays there are depths of 1.5 to 6.5 m (4.9 to 21.3 ft.).

Approach and entrance.—The fjord is approached from Aarø Sund through a channel

that is entered about $\frac{3}{4}$ mile northward of Aarø-sund harbor. There is a **buoy** moored here which also marks the northern side of the fairway in Aarø Sund. The channel leads about $1\frac{1}{4}$ miles in a general west-northwesterly direction to the entrance of the dredged channel and is marked on both sides by **buoys**, of which the outer ones are equipped with reflecting prisms.

Fjord.—The inlet varies in width from about 120 to 800 yards from the entrance to the harbor. The channel is marked adequately with **buoys**, and there are **warping poles** located about $2\frac{1}{2}$ and 5 miles within the entrance of the dredged channel. The warping poles on the north side of the channel have red bands and those on the south side have white bands.

Submarine cables cross the fjord nearly $\frac{1}{2}$ mile and about $\frac{3}{4}$ miles eastward of the harbor entrance. The landing places are marked by **beacons** on the south shore.

Harbor.—The harbor is an artificial basin, about $\frac{1}{2}$ mile long, that is quayed only on the north side. The area off the quays is dredged to depths varying from 13 to 21 feet; the outer dredged area is about 400 feet wide. There are a number of dolphins on the south side of the dredged area and one stands close off the easternmost quay. The head of the harbor is shallow. A bridge crosses the waterway that leads from the harbor to the dam of the lake. On the south side of the harbor there is a boatyard.

Regulations.—In the dredged channel all power-driven vessels must not exceed a speed of 6 knots. Outbound vessels without a pilot must avoid meeting an inbound vessel in places where the passage is difficult.

Pilots for Haderslev are available at Aarø-sund harbor and off the west side of Aarø.

3C-13 HADERSLEV is the commercial center for the farming area in this part of Lille Bælt. The main

activities are the collection and processing of agricultural products for export and the manufacture of textiles and clothes. Other activities include several machine shops, a lumber mill, and a malting industry. The principal imports are coal, grain, fertilizers, and lumber. The main exports are agricultural products, grain, malt, and foundry sand. The population is about 20,000. A customhouse and a harbor office are located near the waterfront.

There are six quayed berths that vary in length from 330 to 820 feet. The outer two berths, one of which is 820 feet long, have a depth of 21 feet alongside. At the other berths the depths alongside decrease from 18 feet at the east end to 13 feet at the west end. Westward of the quayed area there are accommodations for small craft and lighters alongside a wharf that has a depth of 5 feet. Two bridge transporters stand on the outer quays and a 6-ton crane is located on an inner berth. The quays are all served by the railroad.

Provisions, coal, and fuel oil are available. Water is piped onto the quays. Small repairs can be effected. Tug assistance is also available.

The town is connected with the general telephone, telegraph, and railroad systems. There are two hospitals in the town.

SOUTHEASTERN APPROACH TO THE MAIN CHANNEL

3C-14 Between Sønderby Klint (sec. 3C-8) and Lindehoved, about $5\frac{1}{2}$ miles south-south-eastward, the coast consists for the most part of the western side of the peninsula of Helnæs. Aakrog Bugt lies close southeastward of Sønderby Klint and has general depths of 6 to $9\frac{3}{4}$ fathoms. Dreslette Church, nearly 4 miles eastward of Sønderby Klint, and Flemløse Church, about $5\frac{1}{4}$ miles east-northeastward of Sønderby Klint, are prominent landmarks.

The northern end of Helnæs is connected to the island of Fyn by a narrow neck of land. There are several hills up to 98 feet in height on the north and south ends of the peninsula, and the central part is flat. At several places along the west side of Helnæs there are steep yellow cliffs.

The 6-fathom curve trends irregularly along this coast, varying in distance from about $\frac{1}{4}$ mile off Søndeby Klint to about $1\frac{1}{4}$ miles off the northern end of Helnæs. A wreck lies about 1 mile southeastward of Søndeby Klint. A detached $28\frac{1}{2}$ -foot patch lies about $2\frac{1}{2}$ miles northwestward of Lindehoved.

The dangers lying southwestward through westward of Søndeby Klint are described in section 3C-8. The dangers lying between Helnæs and the island of Als are described in section 3D-4.

ANCHORAGES

3C-15 With few exceptions there is anchorage almost anywhere in the central part of Lille Bælt as the depths can accommodate large and small vessels and the holding ground is generally good.

Bredningen.—See section 3C-7.

Off Brandø.—See section 3C-7.

Off Assens.—See section 3C-9.

Part D. SOUTHERN PART OF LILLE BÆLT

3D-1 Halk Hoved ($55^{\circ}12' N.$, $9^{\circ}42' E.$), which is 72 feet high, is a steep headland consisting of nearly vertical cliffs. There are bushes and some tall trees growing on this point. The 6-fathom curve lies nearly $\frac{3}{4}$ mile off this point.

Lindehoved ($55^{\circ}08' N.$, $9^{\circ}59' E.$) is the western extremity of Helnæs. The 6-fathom curve that contains the shorebank extending from the peninsula lies over $1\frac{1}{4}$ miles westward of the point. A buoy is moored close southward of the western end of this bank.

Helnæs Light is shown from a position a short distance southward of Lindehoved.

GENERAL

3D-2 The southern part of Lille Bælt as defined by this volume, in addition to describing the passage proper, includes a description of

Aabenraa Fjord, Als Fjord and Als Sund as far as but not including the port of Søndborg, and Marstal Bugt. The southern limit of this area on the east is Gulstav, located on Langeland about 35 miles southeastward of Lindehoved, and on the west is Pøls Huk, located about 23 miles southeastward of Halk Hoved.

The main passage in this part of Lille Bælt is deeper, less encumbered with detached dangers, and wider than the central part. However, the coastal configuration on both sides of this southern part of Lille Bælt trends more erratically. In general, the terrain on Jylland and the islands consists of rolling hills and low land and is interspersed with highly cultivated fields and wooded areas.

The passage has the island of Als on the west side and the peninsulas of Helnæs and Hornenæs and the islands of Lyø and Ærø on the east side. Helnæs Bugt lies between the two peninsulas. Marstal Bugt, between Ærø and Langeland, and the southern end of Langeland lie in the southeastern approach to Lille Bælt.

The coastal indentation between Halk Hoved and Als recedes about $8\frac{1}{2}$ miles westward to form a large bay. The southwestern side of this bay is a common access to Aabenraa Fjord and Als Fjord. Als Fjord, about 6 miles long, in conjunction with Als Sund, about 5 miles long, separate Als from Jylland and also provide the northern approach to the port of Søndborg. Augustenborg Fjord is a southeasterly continuation of Als Fjord.

There are two channels that pass through the dangers lying between Helnæs and Als. The western channel, which leads between Als and the shoals of Hesteskoen and Søndre Stenrøn, is the principal one. It is well indicated with buoys and light sectors. The eastern channel lies between Helnæs and the shoals of Lille Grund and Lang Grund.

The passage southward of Fyn to the port of Svendborg and the number of fairways and islands southward of Fyn are approached

through the waters lying between Hornenæs and Lyø and between Lyø and Æro; they are all described in part E.

Aabenraa, the principal port in this area, lies at the head of Aabenraa Fjord. Augustenborg, a smaller port, lies at the head of Augustenborg Fjord. The terminal of the Als-Fyn ferry is located at Mommark, on the eastern side of Als. The port of Sønderborg is described in section 4A-11.

DEPTHS

3D-3 The depths in this part of Lille Bælt are irregular because of the number of detached shoals that lie predominantly in the northern part of the passage. Excepting these shoals there are general depths of 10 to 23 fathoms between the shorebanks.

In the recommended fairway of the western channel that circumvents the shoals there is a least depth of 11 fathoms. In the recommended fairway of the eastern channel that circumvents the same shoals there is a least depth of $6\frac{1}{2}$ fathoms.

The large bay entered between Halk Hoved and Als has depths varying from 6 to 18 fathoms seaward of the shorebank; the greater depths are found in the approach to Aabenraa Fjord and Als Fjord.

Aabenraa Fjord has general depths of 5 to 19 fathoms. A channel dredged to a depth of 28 feet leads to the port of Aabenraa at the head of the inlet.

Als Fjord has general depths of 6 to 18 fathoms except for a detached $4\frac{1}{2}$ -fathom patch at the eastern end. Als Sund has general depths of $4\frac{1}{3}$ to 10 fathoms. Augustenborg Fjord has general depths of 3 to $7\frac{1}{2}$ fathoms between the extensive shorebanks, and a channel dredged to a depth of 13 feet leads to the port of Augustenborg.

DANGERS

3D-4 The dangers described herein comprise the detached shoals and banks that have depths

of less than 6 fathoms. The dangers that fringe the islands and coast are described with the related features.

Schønheyder Banke, about $1\frac{3}{4}$ miles southward of Halk Hoved, has a least depth of 25 feet and a bottom of clay mixed with sand and stones.

Holst Banke, with a least depth of 24 feet, clay mixed with sand and stones, lies with its shoalest spot about 4 miles southward of Halk Hoved.

A wreck with a depth of $5\frac{1}{2}$ fathoms lies between Schønheyder Banke and Holst Banke in a position about $3\frac{1}{4}$ miles southward of Halk Hoved.

Detached patch.—A 22-foot patch lies on the western side of the eastern channel in a position about $2\frac{1}{4}$ miles westward of Lindehoved.

Lille Grund, a stony patch with a depth of 12 feet, lies on a 6-fathom bank in a position about $2\frac{3}{4}$ miles west-southwestward of Lindehoved. A buoy is moored in a depth of 24 feet on the east side of the patch. **Lang Grund**, a $19\frac{1}{4}$ -foot patch, lies on the same bank in a position about 1 mile southward. The two patches and the bank lie on the west side of the eastern channel.

Hesteskoen is a steep-to and partly drying reef that lies on a small 4-fathom shoal in a position about $2\frac{1}{2}$ miles northeastward of Tranerodde (sec. 3D-9). A buoy is moored in a depth of $7\frac{1}{2}$ fathoms on the northeast side of the reef. Another buoy is moored in a depth of 6 fathoms on the west side of a 28-foot patch close westward of Hesteskoen. There is a channel with depths of $6\frac{1}{2}$ to 12 fathoms between Hesteskoen and the bank on which Lang Grund lies.

Søndre Stenrøn is a 2-foot stony patch that lies on the northern end of a sandy shoal in a position about $3\frac{1}{4}$ miles east-northeastward of Tranerodde. Several other shoals, with depths of 19 to $28\frac{1}{2}$ feet, lie southwestward and south-eastward of the 2-foot patch. Søndre Stenrøn and the other shoals are contained within a 10-

fathom bank which has its southeastern end lying about 5 miles east-southeastward of Tranerødde. The western, northeastern, and southeastern ends of this shoal area are marked with **buoys**; the western buoy is moored in a depth of 7 fathoms.

The western channel in Lille Bælt leads southwestward of Hestekoen and Søndre Stenrøn. There is also a channel between Hestekoen and Søndre Stenrøn in which the depths exceed 10 fathoms.

Vodrups Flak is a shoal area with a least depth of $28\frac{1}{2}$ feet and a bottom of sand and small stones. It lies on the coastal bank, as defined by the 10-fathom curve, about $2\frac{1}{4}$ miles offshore in a position about $5\frac{1}{2}$ miles west-northwestward of Vejsnæs Nakke (sec. 3D-10). A 6-fathom patch lies nearly $\frac{3}{4}$ mile east-northeastward of the $28\frac{1}{2}$ -foot shoal.

A **wreck** with a depth of $9\frac{3}{4}$ fathoms lies about $1\frac{1}{4}$ miles northwestward of Skjoldnæs (sec. 3D-10).

Vejsnæs Flak is a shoal area with depths of 6 fathoms and less that lies between about $3\frac{1}{4}$ and $5\frac{1}{4}$ miles southward of Vejsnæs Nakke. The least depth, $19\frac{1}{4}$ feet, lies about $4\frac{1}{2}$ miles southward of the point. A detached 6-fathom patch lies about $5\frac{1}{4}$ miles south-southwestward of Vejsnæs Nakke.

Gulstav Flak and the dangers off Gulstav are described in section 3D-10.

WATER LEVEL

3D-5 General information on water level is given in section 3-2.

In the open waters the mean range of tide is small, but where the coastal configuration is irregular and where the passages are constricted it may amount to 5 feet.

In general, winds from the east and northeast may raise the water level from $1\frac{1}{4}$ to over 4 feet, depending on the locality, and winds from the west and northwest may decrease the water

level the same amount. At certain times these amounts may be greater.

CURRENTS

3D-6 The factors governing the direction and velocity of the surface currents in Lille Bælt are described in section 3-3. Because there are variations in the degree of influence each of these factors may be exerting at any one time, it is particularly difficult to give an accurate pattern of currents. However, observations used to calculate the mean current under certain wind conditions indicate the following to exist in the main passage of this part of Lille Bælt:

1. Gentle westerly winds produce a south-going current with a rate of about $\frac{1}{4}$ to $\frac{1}{2}$ knot. Strong westerly winds increase the rate to about 1 and $1\frac{1}{2}$ knots.

2. Gentle northerly winds also produce a southgoing current but it is somewhat weaker. Strong northerly winds may produce a northerly current with a rate of about $\frac{1}{2}$ to 1 knot.

3. Gentle southerly and easterly winds produce a northgoing current. With strong winds from these directions the rate of the current is about 1 to $1\frac{1}{2}$ knots.

ICE

3D-7 See section 3-4.

COASTAL FEATURES—HALK HOVED TO TONTOFT NAKKE

3D-8 Schønheyder Banke and Holst Banke, both described in section 3D-4, lie in the entrance of the coastal indentation between Halk Hoved and Tontoft Nakke, the northern extremity of Als.

The Jylland coast between Halk Hoved and Knudshoved, about 8 miles southwestward, trends very irregularly. It forms three small bays, Sandvig, Diernæs Bugt, and Genner Fjord. The island of Barsø lies about 1 mile offshore in the entrance of Genner Fjord and

affords shelter to this inlet. The 5-fathom curve also trends very irregularly along this coast, varying in distance from less than 200 yards offshore to about $1\frac{1}{4}$ miles offshore, and Barsø is fringed by dangers. Elsewhere the depths vary from 5 to 16 fathoms.

The land at Halk Hoved and for 2 miles southwestward is high and cliffy. At the heads of the three bays the land is low and marshy; between these marshy areas are wooded groves. Rolling hills and open fields back the coast.

Knivsbjerg, a prominent hill 302 feet in height, is located about 1 mile inland from the head of Genner Fjord. There is a saddle between two bare hills that stand on the north side of Barsø.

Sandvig, entered about $2\frac{1}{2}$ miles southwestward of Halk Hoved, has general depths of 3 to 10 fathoms. The bay provides good anchorage, bottom of sand and ooze, sheltered from all except winds between southeast and southwest, which may raise a sea here.

Barsø, a small island 125 feet high in its northern part, is located about 6 miles southwestward of Halk Hoved. The eastern side of the island is fronted by a shoal area that extends nearly 1 mile offshore; a buoy is moored on the southeastern side of this shoal. Otherwise the island is fairly steep-to.

Two submarine cables are laid between the southwestern side of Barsø and the mainland. Range beacons mark the landing places on the mainland and the landing place of the southern cable on Barsø.

Caution.—A firing area, marked by buoys, is located between Barsø and Schønheyder Banke.

Genner Fjord, a well-sheltered bay about 2 miles long, has general depths of 5 to 11 fathoms between the shorebanks. An islet connected to the mainland by a bridge lies at the head of the bay. The small harbor of Kalvø (Kalven) which is used by small craft and fishing boats lies immediately northward of the islet. There is a pier with depths of 3 to 10 feet in this harbor.

The bay is entered either northward or southward of Barsø. Sønderballe Hoved, the northern entrance point, is a wooded headland 59 feet high. A reef with depths of less than 3 fathoms extends nearly $\frac{1}{2}$ mile eastward from this point. A buoy moored in $6\frac{1}{2}$ fathoms marks the outer end of this danger. Knudshoved, the southern entrance point, is a steep point 52 feet high. A steep-to reef extends nearly $\frac{3}{4}$ mile northeastward from the point, and a shoal bank marked by a buoy on the outer end extends over 1 mile eastward from the point.

The bay affords good sheltered anchorage in depths of about $8\frac{1}{2}$ fathoms.

Aabenraa Fjord and Als Fjord, which are entered between Knudshoved and the northwest coast of Als are described in sections 3D-11 and 3D-12, respectively.

Northwest side of Als.—The coast between Tontoft Nakke and the eastern entrance point of Als Fjord, nearly $4\frac{1}{4}$ miles west-southwestward, is low and woodless. All the dangers lie within the 5-fathom curve which follows the trend of the coast from about $\frac{1}{4}$ to $\frac{1}{2}$ mile offshore. A buoy moored about $\frac{1}{2}$ mile northward of Tontoft Nakke marks the outer end of the steep-to shorebank that extends from that point.

Nordborg Light is shown from a position near the coast about $1\frac{1}{2}$ miles west-southwestward of Tontoft Nakke.

NORTHERN PART OF THE MAIN PASSAGE INCLUDING HELNÆS BUGT

3D-9 The northern part of the main passage is defined as lying between the northeast coast of Als, on the west, and the peninsulas of Helnæs and Hornenæs and the island of Lyø, on the east. The central shoals lying between Helnæs and Als are described in section 3D-4.

Northeast coast of Als.—The coast between Tontoft Nakke and Taksensand Light, about $8\frac{3}{4}$ miles southeastward, forms the southern

side of the western channel. The coastal dangers are contained within the 5-fathom curve which lies up to $\frac{1}{2}$ mile offshore except off Tranerodde, a small sandspit located about midway between Tontoft Nakke and Taksensand Light. Off Tranerodde the 5-fathom curve lies about 1 mile offshore northeastward of the point and nearly $\frac{3}{4}$ mile offshore southeastward of the point. A buoy is moored in a depth of $5\frac{1}{2}$ fathoms about 1 mile northeastward of Tranerodde and another buoy is moored in a depth of 11 fathoms about $\frac{3}{4}$ mile northward of Taksensand Light.

Tontoft Nakke is a rounded projection 17 feet high. The coast farther southeastward is fairly high and has steep cliffs in some places. Between Tranerodde and Taksensand Light there is an extensive wooded area, and elsewhere there are small wooded areas that obscure the view of the interior of the island so that few prominent landmarks are seen from seaward.

Taksensand Light and a light shown on Tranerodde have light sectors that guide vessels through the fairway in the western channel.

A submarine cable is laid from a point about $\frac{3}{4}$ mile southeastward of Taksensand Light and extending in a northeasterly direction to Hornenaes. Each landing place of the cable is marked by lighted range beacons.

Directions for the western channel.—The following directions lead between the central shoals and the shorebank off Als in a least depth of about 11 fathoms.

From a position about $1\frac{3}{4}$ miles southward of Aarø (sec. 3C-8), vessels should steer 159° for Tranerodde Light until Taksensand Light bears 136° . At this position, about $2\frac{1}{2}$ miles eastward of Tontoft Nakke, vessels should steer 136° for Taksensand Light until Tranerodde Light bears 290° astern. Thence vessels should steer with that bearing (290°) astern until a position about 2 miles eastward of Taksensand Light is reached.

Helnæs.—The west side of this peninsula and Helnæs Light are described in sections 3C-14 and 3D-1. The south side of the peninsula is about 25 to 35 feet high and forms the north-

ern side of the entrance of Helnæs Bugt. The village of Helnæs stands on the east side of the peninsula and has a church that can be seen only from certain directions at sea.

Hornenæs ($55^\circ 05' N.$, $10^\circ 05' E.$), about $2\frac{1}{2}$ miles south-southeastward of Helnæs, is the western end of an irregularly shaped peninsula and is also the southern entrance point to Helnæs Bugt. This headland has steep cliffs along the shore and rises to a height of 131 feet a short distance inland. The shorebank as defined by the 5-fathom curve extends about $\frac{1}{2}$ mile westward from the southwestern extremity of the headland. Horne Church which has a tall steeple and two small spires stands out prominently on the high ground about 4 miles inland.

Lyø lies about 2 miles southeastward of Hornenæs. The northwest side of the island is flat but the west and south sides are steep and cliffy. A prominent windmill stands on the island. A village with a church is located near the center of the island; the church is surrounded by high trees and is seen only from certain directions at sea. **Lyo Light** is shown from the northern extremity of the island.

Shoals that are contained within the 5-fathom curve extend up to $1\frac{1}{2}$ miles from the western side of the island. A rock with a depth of $15\frac{1}{2}$ feet lies near the western end of the shoals. A buoy is moored in a depth of $5\frac{1}{2}$ fathoms a short distance westward of this submerged rock.

Directions for the eastern channel.—From a position about $1\frac{3}{4}$ miles southward of Aarø (sec. 3C-8) vessels should steer about 124° for Helnæs Light until Nordborg Light bears 235° . Thence course should be altered to 149° to pass close westward of the dangers extending from Helnæs and eastward of Søndre Stenrøn. When Horne Church bears 058° vessels will be in a position about $1\frac{1}{2}$ miles northeastward of the southeastern shoal of Søndre Stenrøn.

Helnæs Bugt is divided into two natural basins by a large shoal that extends from the eastern end of Helnæs to the opposite shore. Three small islands stand on this shoal.

Sønder Fjord, the southern basin, has general depths of 3 to 11 fathoms in its deeper western part. The southwestern side is fronted by the shorebanks extending from Helnæs and the greater part of the eastern side is encumbered with shoals. The entrance lies about 3/4 mile off the Hornenæs shore. There are two piers with depths of 5 to 6 1/2 Hornenæs, and a pier with depths of 1.1 to 1.5 m (3.6 to 4.9 ft.) at Faldslet, at the northern end of Sønder Fjord.

Nørre Fjord occupies the northern part of Helnæs Bugt and is somewhat larger and less encumbered with shoals than Sønder Fjord. A channel with a depth of 12 feet lies between Helnæs and the westernmost island and leads to Nørre Fjord, where there are general depths of 3 to 6 1/2 fathoms. BUOYS mark this channel. A SUBMARINE CABLE is laid between Helnæs and the latter island; the landing places on each shore are marked with BEACONS.

SOUTHERN PART OF THE MAIN PASSAGE INCLUDING MARSTAL BUGT

3D-10 EAST COAST OF ALS.—From Takensand Light the coast trends regularly south-southeastward for about 9 miles to Pøls Huk. The coast is fairly high and steep, and there are small wooded areas in places. All the dangers lie within the 5-fathom curve which lies at its greatest distance about 2/3 mile offshore; the 10-fathom curve lies at most about 1 mile offshore.

Fynshav Ferry Harbor, protected by breakwaters on the northern and southern sides, is located about 1 mile southeastward of Takensand Light. The breakwater heads are marked by lights. A fog signal is sounded at the southern breakwater head. Leading lights, in line 211°, are occasionally exhibited.

A submarine cable is laid between Fynshav Ferry Harbor and Hornenæs.

MOMMARK FERRY HARBOR, nearly 3 1/2 miles northward of Pøls Huk, is the Als terminal for ferry service to Faaborg. A breakwater extends northeastward from the shore and protects the ferry slip. There is a depth of 4.7 m (15.4 ft.) in the approach and at the ferry slip. A light is shown from the head of the breakwater; a light is shown from each side of the entrance to the ferry slip.

A SUBMARINE CABLE is laid across the main passage between Hummel Vig, located about 1 1/2 miles northward of Pøls Huk, and a position on Ærø about 3 1/2 miles southward of Skjoldnæs. LIGHTED RANGE

beacons mark the landing position on each shore.

PØLS HUK (54° 53' N., 10° 04' E.) is the southeastern extremity of Als. A LIGHT is shown near the coast about 1/2 mile northward of the point. Pøls Rev, a shorebank on which there are some submerged rocks, extends about 1 1/2 miles southeastward from the point. The eastern side of this shoal is steep-to. A LIGHT BUOY is moored on the outer end of Pøls Rev.

WEST COAST OF ÆRØ.—Skjoldnæs, the northwestern extremity of the island, lies about 4 miles south-southeastward of Lyø and rises to a height of 82 feet a short distance inland. From Skjoldnæs the coast trends regularly about 12 miles southeastward to VEJSNÆS NAKKE, the southern extremity of the island. The latter point is a bluff with a hillock on it, the whole being 72 feet high. The island is well populated and woodless but the numerous hedges on it give the appearance of being wooded. A ridge of hills runs along the longitudinal axis of the island, the highest elevation, about 220 feet, being near the center of the island. Along the shore there are steep cliffs.

Excepting the wreck about 1 1/4 miles northwestward of Skjoldnæs and Vodrup's Flak (sec. 3D-4) there are no detached dangers, and the 5-fathom curve lies at most about 3/4 mile offshore.

LIGHTS are shown near Skjoldnæs and on Vejsnæs Nakke. A FOG SIGNAL is sounded near Skjoldnæs Light.

MARSTAL BUGT is entered between Vejsnæs Nakke and Gulstav, about 10 3/4 miles southeastward. The bay lies between the south side of Ærø and the southwest side of Langeland. A sand flat with several small islets on it connects these two islands and separates the bay from the waters southward of Fyn. The small port of Bagenkop is located on Langeland about 2 miles northward of Gulstav Klint.

The danger in the approach, Vejsnæs Flak, is described in section 3D-4. With the following exceptions the bay has general depths of 5 to 11 fathoms. A rocky patch with a depth of 22 1/2 feet lies in the entrance about midway between the entrance points. A 28 1/2-foot patch lies about 3 1/2 east-southeastward of Vejsnæs Nakke. The shorebank, as defined by the 5-fathom curve, lies within 1 mile of

both shores except off the eastern end of Ærø where it extends about 2 miles offshore.

Both sides of the bay are low, although there are a few steep bluffs between Gulstav and Bagenkop and several hills, up to 98 feet in height, lie close to shore here and there.

The port and town of Marstal, which are described in section 3E-12, are located at the eastern end of Ærø. The port has two approaches, one from the north and the other from the south. The southern approach, Klørdyb, is also the western channel that leads through the sand flat at the head of the bay. A BUOY moored a short distance eastward of the irregularly shaped peninsula at the eastern end of Ærø marks the entrance to this channel.

A SUBMARINE CABLE is laid across the head of the bay. RANGE BEACONS on the shores of Ærø and Langeland indicate the direction of the cable.

BAGENKOP is a small port with a harbor consisting of three basins, protected by breakwaters, one extending northward and one westward. Two central moles, the western about 260 feet long and the eastern about 375 feet long, divide the harbor into three basins. The entrances to the western and central basins are 60 feet wide. There are depths of 5.0 m (16.4 ft.) in the approach channel, 3.0 to 3.5 m (9.8 to 11.4 ft.) in the western basin and 3.0 m (9.8 ft.) in the central and eastern basins. A ferry slip, with a depth of 5.0 m (16.4 ft.), is located at the eastern extremity of the approach channel.

Northeasterly gales raise the water level and southwesterly and westerly winds lower it. Local fishermen act as pilots. Water and small quantities of provisions and coal are available.

LIGHTS are shown in the entrance of the harbor, and a FOG SIGNAL is sounded occasionally. A lighted range marks the channel.

ANCHORAGE IN MARSTAL BUGT.—This bay affords sheltered anchorage with northerly winds. Vessels can anchor in any convenient position according to draft.

DANGER AREAS.—A danger area about 2 1/2 miles long, east and west, and about 1 1/2 miles wide lies with its center nearly 4 miles south-southeastward of Vejsnaes Nakke. A channel, open to shipping, crosses the area from the northwest corner to the southeast corner. A danger area, about 4 1/4 miles long, west-northwestward and east-southeastward, and about 1 3/4 miles wide, lies with its center about 3 1/4 miles south-westward of Gulstav Klint. A prohibited anchorage area extends about 5 miles north-

eastward from Keldsnor Light and about 3 miles off Langeland.

GULSTAV is the headland forming the southern end of Langeland. GULSTAV KLINT, the southwest point of this headland, is a prominent cliff 42 feet high. DOVNS KLINT, the southern extremity of Langeland, is a white cliff 52 feet high. The light at Keldsnor and the east coast of Langeland are described in section 2C-6.

The 5-fathom curve rounds the headland at a distance of about 3/4 mile off the west and south sides and about 1 1/4 miles off the southeast side; a buoy is moored, respectively, 3/4 mile southward and westward of the headland. A wreck, with a depth of 9.4 m (5.1 fm), lies about 3/4 mile south-southwestward of Gulstav Klint.

GULSTAV FLAK, a shore bank with depths of less than 20.0 m (10.9 fm), extends about 4 1/2 miles southward from Gulstav; a wreck, with a depth of 11.3 m (6.1 fm), lies near the southern extremity of the bank. A wreck, with a depth of 5.5 m (3.0 fm), lies about 5 1/2 miles south-southwestward of Dovns Klint. A wreck, with a depth of 6.7 m (3.6 fm), lies about 5 miles eastward of Gulstav Flak.

AABENRAA FJORD AND AABENRAA

Position: 55°03'N., 9°26'E.

Depths: Fjord, 9.2 to 34.7 m (5.0 to 19.0 fm).

Dredged channel, 8.5 m (27.8 ft.).

Harbor berths, 2.1 to 8.5 m (6.8 to 27.8 ft.).

Tidal range: 2 to 3 feet.

3D-11 Aabenraa Fjord is a deep and spacious inlet that is entered between Knudshoved (sec. 3D-8) and Varnæs Hoved, nearly 3 miles south-southeastward. The fjord indents the coast about 5 1/2 miles in a west-southwesterly direction and is high and wooded on both sides. The port of Aabenraa is located on the northern side of the head of the fjord and is approached through a channel dredged through the shorebank. Enstedværket harbor is on the southern side of the head of the fjord.

WATER LEVEL.—In the port of Aabenraa, the mean range between high and low water is about 1 foot. Northeasterly winds raise the water level 4 1/2 to 5 1/2 feet; southwesterly winds lower the water level 3 to 6 feet.

Ice.—See table 4 in chapter 1. Navigation is generally open the year around although ice-breaker assistance may be required at times.

Depths.—In the fjord there are general depths of 5 to 19 fathoms and there are no detached dangers. The danger off Knudshoved is described in section 3D-8. The 5-fathom curve lies about $\frac{1}{3}$ mile off the north and south sides of the fjord and about $\frac{1}{2}$ mile off the head of the fjord.

The least depth in the entrance channel to the port of Aabenraa is 28 feet.

Fjord.—Varnæs Hoved is a steep point 78 feet high. Both sides of the fjord are high and rather heavily wooded; the south side is higher and has more steep cliffs. A number of streams drain the lakes and bogs a short distance inland and discharge into the fjord.

Mussel beds marked by **poles** are located on the shorebank off the northern shore in positions a short distance eastward and about $1\frac{1}{2}$ miles eastward of the port of Aabenraa.

A **light** is shown at the head of the fjord. The buildings in and around the town of Aabenraa stand out prominently.

At Enstedvaerket, a pier, sheltered eastward by a mole, extends about 190 yards northward from an area of landfill projecting offshore. Depths in the approach and along the western side of the pier are 10.0 m (32.8 ft.); depths along the eastern side are 7.2 m (23.6 ft.); depths in a slip along the western side of the landfill area are 4.0 m (13.1 ft.). A light is shown from the molehead; two lights are shown from the pierhead.

Harbor approach.—The entrance to the channel is located about $\frac{1}{2}$ mile southeastward of the harbor. The channel leads to the harbor in two reaches, the sides of which are marked with **buoys**. The outermost buoy and an inner buoy are equipped with radar reflectors. Several other buoys mark the dangers on the shorebank eastward of the channel.

The outer reach in the channel is indicated by a pair of **light beacons** in range 322° that stand in Sydhavn. The inner reach is indicated by a pair of **light beacons** in range 350° that stand at the head of Nyhavn.

The least depth in the entrance channel is 28 feet. This depth is found in the dredged channel, which has a least width of 175 feet.

Harbor.—The harbor consists of three basins: Sydhavn, Gammelhavn, and Nyhavn. Sydhavn and Gammelhavn are small and irregularly shaped basins that open into the harbor entrance. Each has accommodations for a medium-size vessel. Nyhavn, the largest and deepest basin, occupies the northern, or remaining, part of the harbor and is quayed only on its west side. A tanker berth consisting of a platform and two dolphins lies on the southeast side of the entrance to Nyhavn.

A turning basin in the harbor entrance has a swinging width of about 540 feet in a depth of 28 feet.

A **light** is shown on the head of the mole that separates Sydhavn from Gammelhavn.

Anchorage.—There is good anchorage throughout the fjord in 6 to 17 fathoms, ooze and sand. Large vessels can anchor off the port in a position about 1 mile southeastward of the harbor.

Pilots are available at the harbor.

AABENRAA, a town with a population of about 14,572 (1965), is a commercial center for the surrounding countryside. There are several machine shops, an organ factory, and a brewery, but the main activity is based on the transshipment of agricultural products and supplies. The main imports are coal, coke, grain, and fodder. Livestock and grain are the principal exports. The customhouse and harbor office are situated at the foot of the mole separating the two outer basins.

Sydhavn has an uninterrupted berth along its north side that is 820 feet long with a depth of 18 feet alongside. The south side of the basin has a sloping quay and two L-shaped piers; this side of the basin has depths of 2.1 to 5.5 (6.8 to 18.0 ft.) and is used by fishing vessels and small craft.

Gammelhavn has about 2,000 feet of quayage with 24 1/2 feet alongside.

Nyhavn has a quay that is 1,500 feet long. There is a depth of 6.5 m (21.3 ft.) alongside the northern berth, a depth of 24 1/2 feet alongside the middle berth, and a depth of 8.5 m (27.8 ft.) alongside the southern berth.

The tanker berth has a depth of 8.5 m (27.8 ft.) alongside. A pipeline leads from the berthing platform to the tank farm.

There are two bridge transporters in Nyhavn and two 5-ton travelling cranes in Gammelhavn. The three basins are served by the railroad.

Water is piped to the berths in Gammelhavn and Nyhavn. Provisions are available and a moderate stock of coal is maintained. Only small repairs can be made. Tugs are available.

The town is a terminus of a branch line of the general railroad system. It is also connected to the general telephone and telegraph system. There is a hospital in the town.

Deratting.—see section 1-7.

ALS FJORD

3D-12 This fjord is entered between Varnaes Hoved and the northwest end of Als and leads about 7 miles in a general southeasterly direction to the entrance of Als Sund and Augustenborg Fjord. The fjord is only about 1 to 1 1/2 miles wide and has general depths of 6 to 18 fathoms in the fairway. The south side of the fjord is unindented and is higher and more wooded than the north side. Part of the north side is steep and part of it slopes gradually. Stegvig and Sandvig are two bays on the north side.

Both sides of the fjord are fairly steep-to; the 5-fathom curve lies up to 1/3 mile off each shore. The shorebank extends nearly 1/2 mile northeastward from Snogbaek Huk, the western entrance point of Als Sund, and is marked on its outer end by a light buoy

equipped with a radar reflector, moored in a depth of about 5 fathoms. Light buoys mark the passage through the fjord to Als Sund.

A detached 27 1/2-foot patch lies in the fairway about 3/4 mile northeastward of Snogbaek Huk.

There is a ferry service between Ballebro and the opposite shore.

A light is shown at Ballebro, located on the south shore about 4 1/4 miles southeastward of Varnaes Hoved.

A submarine cable crosses the fjord about 3/4 mile northwestward of Ballebro. The landing place on each shore is indicated with a pair of range beacons; the beacons on the south shore are lighted.

STEGVIG indents the coast of Als and is entered about 1 mile southward of the northern entrance of the fjord. Detached patches of 5.4 to 9.2 m (17.7 to 30.1 ft.) lie in the bay entrance. There are depths of 5 to 10 fathoms in the outer part of the bay. The inner part of the bay is encumbered with shoals. A channel with a depth of 11 1/2 feet and marked by perches leads through the inner shoals to Dyvig. At the head of Dyvig there is a pier with a depth of 2.5 m (8.2 ft.) at its head, where vessels unload for the town of Nordborg.

Sandvig lies northeastward of Snogbaek Huk and has general depths of 5 to 10 fathoms.

Stevning Nor, entered close southward of Sandvig, is a small shallow inlet that is available for small vessels not exceeding 13 feet in draft.

NOTE.—Large vessels navigating in Als Fjord and Als Sund are advised to employ a pilot because there is considerable traffic by small vessels and the currents may be setting strongly at times.

AUGUSTENBORG FJORD AND AUGUSTENBORG

3D-13 Augustenborg Fjord, the southeasterly continuation of Als Fjord, is entered between Arnkilsore, the eastern entrance point of Als Sund, and Stolbro Naes, about 3/4 mile east-northeastward. The fjord is about 3 3/4 (continued on page 171)

miles long and has general depths of 3 to 7½ fathoms between the shorebanks. The head of the fjord is encumbered with shoals.

The shorebank on the western side of the fjord is less extensive than the one on the eastern side of the fjord. A buoy moored in a depth of about 19 feet marks the outer edge of the western shorebank about 1¼ miles within the fjord entrance; the shorebank here is very steep-to.

There is **anchorage** for small vessels in about 5 fathoms about 2 miles inside the fjord.

Augustenborg.—The port of Augustenborg occupies a small shallow inlet that extends northeastward from the head of the fjord. A dredged channel with a depth of 13 feet and marked with buoys leads to the harbor. A buoy is moored on the eastern side of the approach to this dredged channel in a position about 1 mile from the head of the fjord.

The mean range of tide is about 5 feet. Northeasterly winds may raise the water level about 4 feet and northwesterly winds may lower it the same amount.

Pilots are available for harbor entry. Special regulations for navigation in the channel are in effect.

A quay about 575 feet long and with a depth of 13 feet alongside is located on the north side of the inlet. The turning basin off this quay has a maximum width of about 250 feet. A mooring buoy and a dolphin are located in the basin. A bridge crosses the inlet at the eastern end of the quay.

The town of Augustenborg fronts the north side of the inlet and has a population of 1,966 (1960). Water and provisions are available. The quay is served by the railroad, which is connected to the general railroad system.

ALS SUND

3D-14 Als Sund is about 5 miles long between its northern entrance points, Snøgbæk Huk and Arnkilsøre, and the port of Sønderborg. Sønderborg and the southern entrance

from Sønderborg Bugt are described in section 4A-11.

The fjord is quite narrow, being about ¼ mile wide in its northern part and only about 300 yards wide near the port of Sønderborg. The fairway between the 5-fathom curves on both sides of the fjord varies from about 100 to 250 yards in width and has depths up to 20.0 m (10.9 fm) in it. The only dangers in the fairway are Middelgrund and Arnkilsgrund, both of which lie within 1 mile of the northern entrance of the fjord.

Middelgrund has a least depth of 7.9 m (25.9 ft.) and lies in the middle of the fairway; a buoy is moored on the center of this shoal. Arnkilsgrund, with a least depth of 3.8 m (12.4 ft.), lies on the eastern side of the fairway and is marked by a buoy on its southwestern side.

The shorebank off Snøgbæk is described in section 3D-12. The shorebank off the eastern entrance point extends about 400 yards offshore and is marked on its western side by a buoy.

Buoys mark the edge of the fairway in various places in the fjord.

Submarine cables cross the fjord about 4 miles southward of Snøgbæk Huk. **Beacons** on the west shore indicate the landing places of these cables. A submarine pipeline crosses the fjord southward of the cables.

A **light** is shown at Sottrupskov, about 1 mile southward of Snøgbæk Huk.

Current.—At times the inflow of water from Sønderborg Bugt causes a northgoing current in the sound which may attain in the vicinity of Sønderborg a rate of 3 to 4 knots.

ANCHORAGES

3D-15 In addition to the places referred to below, there is also good anchorage on the shorebanks on the west side of Ærø and the east side of Als.

Sandvig.—See section 3D-8.

Genner Fjord.—See section 3D-8.

Marstal Bugt.—See section 3D-10.

Aabenraa Fjord.—See section 3D-11.

Augustenborg Fjord.—See section 3D-13.

Part E. FAIRWAYS SOUTH OF FYN

3E-1 Hornenæs, described in section 3D-9, is also the northern entrance point to the main fairway south of Fyn.

GENERAL

3E-2 The fairways and various physical features lying between the south coast of Fyn and the coasts of Ærø and Langeland are described herein. The eastern limit of this area is defined roughly as being the meridian lying between the ports of Svendborg and Rudkøbing.

The main fairway southward of Fyn is the one that connects Lille Bælt with Store Bælt. It is also the western approach channel to Svendborg; Svendborg Sund comprises part of this waterway. The fairway is entered between Hornenæs and Lyø, leads close off the coast of Fyn, and has a least depth of 6.3 m (20.6 ft.) in Svendborg Sund. There is also another entrance to this fairway; it lies between Lyø and Avernako and is approached southward of Lyø.

The greater part of this area is occupied by extensive shoals on which are interspersed numerous islands and islets. However, an area with depths exceeding 10 fathoms lies off the northeast side of Ærø. Taasinge, which forms the south side of Svendborg Sund, is the largest and principal island of the group.

Other than Svendborg and Rudkøbing, both of which are described in chapter 2, the places of commercial significance are the port of Faaborg, on the south coast of Fyn, the ports of Marstal, Søby, and Ærøskøbing, all on the northeast side of Ærø, and the loading place of Ristinge, on the west side of Langeland.

The ports are approached through several shallow channels that lead through the deepest water in this shoal-encumbered area. Mørkedyb, which is entered southward of Drejø, leads between Birkholm and Store Egholm to a relatively deep pool located southward of Strynø.

Rudkøbing Løb, the channel forming the northern and southern approaches to the port of Rudkøbing, is entered eastward of Strynø and leads northward to the port; it is described in section 2D-13.

Marstal is approached from northward through a channel that is entered from the southwestern part of the above-mentioned pool. The southern approach to Marstal is from Marstal Bugt through Klørdyb, a channel which has its entrance described in section 3D-10.

The loading place at Ristinge is approached from Marstal Bugt through Ristinge Løb, a very shallow channel, located close off the Langeland coast.

Højstene Løb is the channel that connects the deep water off the northeast side of Ærø with Svendborg Sund. It is entered on the southeastern side of Drejø.

Buoyage.—Figure 1 shows the direction of the fairways for buoyage purposes.

Pilots.—Pilots stationed at Svendborg Sund conduct vessels to adjacent places and to the Baltic Sea, Lille Bælt, the southern part of Store Bælt and the western part of Smaalands Farvandet. Local pilots are stationed in Aerskøbing, Marstal and Rudkøbing.

WATER LEVEL—CURRENTS

3E-3 The tidal range in the waters south of Fyn is small and may vary from negligible to about 1 or 2 feet.

During certain wind conditions there is a remarkable difference in the rise of water level at various places in these waters. For example: At Faaborg, northeasterly winds may raise the water level as much as 2 feet whereas with the same wind conditions Svendborg may have a water rise of about 5 feet.

In general, winds between north and east cause the water level to rise and winds from the south to west lower the water level. More details on water level are given with the descriptions of the ports.

In Svendborg Sund the current is strongly affected by the winds and as a result is very irregular. Northwest gales cause a westgoing current and east gales cause an eastgoing current. The current may set in the same direction for 5 or 6 days and may attain a rate of up to 6 knots.

At Marstal the current is influenced by the wind.

In Rudkøbing Løb, northwesterly winds cause a southgoing current and northeasterly winds produce a northgoing current.

Because the range of tide is small in these waters, this effect on the current is generally negligible. However, in these waters where the channels are narrow and winding, where there are many islands and shoals, and where there is a variation in water level at different places, the direction and speed of the current will be variable. Off the port of Rudkøbing, during calm weather, the tidal current changes regularly every 6 hours and sets at a rate of about 2 knots. During unsettled weather this same tidal current may increase its speed to 4 or even 5 knots.

ICE

3E-4 Ice formation in the waters south of Fyn may appear quite early in the season. The amount and extent of ice coverage is dependent largely on the severity of the winter. However, the larger ports are generally open to navigation the year around; icebreakers are used when necessary.

Ice has been known to appear as early as the first part of December off Rudkøbing and during the latter part of December or early January in Svendborg Sund. It has been known to remain as late as the first week of

April at both places. As a rule the western part of this area, northward of Ærø, is the last to freeze over. Svendborg Sund is for the most part kept free of any extensive ice formation by the current, but the fairway eastward of Taasinge may have ice conditions that may be of concern to navigation.

Table 5 in chapter 1 has more information on ice.

MAIN FAIRWAY SOUTH OF FYN

3E-5 *Lys Krog*, the principal entrance to the main fairway south of Fyn, lies between the large peninsula of Horne Land and *Lysø*. There are general depths of 6 to 17 fathoms between the shorebanks on either side of the channel.

The coast of Horne Land between *Hornenæs* and *Knolden*, about $4\frac{1}{2}$ miles east-southeastward, is rather steep-to and fairly high. There are some wooded areas and steep cliffs near the shore. The 5-fathom curve lies about $\frac{1}{4}$ mile offshore.

Knolden, the southern extremity of Horne Land, is connected to the peninsula by a very narrow neck of land. It is 98 feet high and has steep light-colored cliffs on its south side. The shorebank extends irregularly about $1\frac{1}{4}$ miles southeastward from *Knolden*. *Knastegrund*, the outer end of this shorebank, has on it a rock with a depth of 2 feet and is marked by three buoys. A lighted buoy is moored a short distance southeastward of the shorebank.

Lysø is described in part in section 3D-9. The northern extremity of the island is a low protruding point that is very steep-to; a shoal marked at the outer end by a buoy extends about $\frac{1}{4}$ mile eastward from the point. A pier with depths of 2.0 to 4.7 m (6.5 to 15.4 ft.) at the head is located off the town on the northern side of the island. Easterly winds may raise the water level up to 6 feet and westerly winds may lower it 5 feet.

The shorebank, as defined by the 5-fathom curve, extends about $\frac{2}{3}$ mile northwestward, about $\frac{1}{2}$ mile northward, and about $\frac{2}{3}$ mile east-

ward from the island. A **buoy** marking the extremity of this shorebank is moored off the east end of the island. A detached 6.2 m (20.3 ft.) patch lies close off the eastern shorebank. The shorebank off the south side of the island extends up to 2 3/4 miles southeastward. Skrams Flak, with a least depth of 4.5 m (14.7 ft.), lies about 1 1/2 miles southeastward of the east end of the island. A lighted buoy is moored off the northwest end of Skrams Flak.

The channel southward of Lyø passes northward of Skrams Flak and joins the main fairway at a position between Knastegrund and Avernakø. This channel has a least depth of 8.7 m (4.7 fm.) in the fairway passing over the above-mentioned shorebank. The light on Bjørno is a guide for negotiating this channel.

Submarine cables cross Lyø Krog between the northern extremity of Lyø and the mainland northward and between the pier on Lyø and the narrow neck of land that joins Knolden with Horne Land. Both landing places on Lyø and the one off Knolden are marked by **beacons**.

Bjørnø and the dangers in its vicinity are described with Faaborg Fjord and its approaches in section 3E-6.

Avernakø, an irregularly shaped island, lies on the south side of the fairway about 2 miles eastward of Lyø. The island is well built over and has several piers on its north side. A low and narrow strip of land divides the island into two parts. Korshavn, the eastern and higher part, rises to an elevation of 108 feet at its eastern end.

The church on the western part of the island is a conspicuous landmark. Lights are shown at Munke, about 1 mile southeastward of the western end of the island, and at Nakkeodde, the northeastern end of the island.

A steep-to shoal marked by a buoy moored in a depth of about 0.9 m (2.9 ft.) extends about 1/3 mile offshore from the northern end of the island. Otherwise the 5-fathom curve lies less than 3/4 mile off the north side of the island. Off the west and east sides of the island the 5-fathom curve lies up to 3/8 mile offshore. A wreck with a depth of 8.4 m (27.5 ft.) lies about 1/2 mile off the west side of the island.

The fairway of the channel which lies between Skrams Flak and the shorebank off the west and northwest sides of Avernakø is marked by three buoys with radar reflectors.

Directions for the main fairway.—Vessels approaching the main fairway **from the northward** should enter through Lyø Krog. To do so, vessels should round Hornenæs at a distance of about 1/2 mile offshore and steer eastward, taking care that the southern extremity of Knolden is not open northward of the northern extremity of Lyø. Having cleared the danger off the northern end of Lyø, vessels should steer about 115° with the northern extremity of Avernakø in range with Nakkeodde. Since this range leads close to Knastegrund, vessels should steer a more southerly course when the danger is approached.

From a position close southward of Knastegrund, vessels should steer a northeasterly course to a position about 1/2 mile northward of the northern extremity of Avernakø, from whence an east-southeasterly course should be steered for a position about midway between Nakkeodde and Store Svelmø.

Vessels approaching the main fairway **from the southward** should use the channel southward of Lyø if the draft of the vessels permits. To approach the fairway, vessels should steer about 023° for the clock tower in the town of Faaborg until the southern end of Bjørnø comes in range about 060° with Aastrup Church, located about 3 miles distant from Bjørnø. Vessels should steer in on the latter range to a position about 1/2 mile northward of the northern extremity of Avernakø and continue as directed in the previous paragraph.

Piers.—Avernakø Pier, with depths of 1.3 to 3.5 m (4.2 to 11.4 ft.) at its head, extends from the northern extremity of the island. Easterly winds may raise the water level 2 to 4 feet and westerly winds may lower it the same amount. Korshavn Pier, about 3/4 mile southwestward of Nakkeodde, has a depth of 2.4 m (7.8 ft.) at its head. Maersk-Møller Havn, a small basin with a depth of

1.2 m (3.9 ft.), lies on the east side of the island.

Two submarine cables cross the main fairway between the northern extremity of Avernako and Bjorno. The direction of the western cable is indicated by a pair of range beacons on Avernako.

ANCHORAGES.—There is good anchorage in 10.0 to 15.0 m (5.4 to 8.2 fm), clay, 1/4 mile northwestward of the pier on the northern side of Lyo.

There is good anchorage in the bight off Korshavn Pier in depths according to draft. The anchorage off Maersk-Moller Havn provides very good shelter from westerly and southerly winds in about 5 1/2 fathoms, bottom blue clay.

FAABORG FJORD AND APPROACHES

3E-6 Faaborg Fjord and its approaches are contained between Knolden and Store Svelmo, about 4 miles east-southeastward. Bjorno and the dangers surrounding it lie in the entrance of the fjord and form two approaches to the fjord. Two channels lead from the approaches to Faaborg Fjord, one on either side of Bjorno. The west channel lies between the island and Sisserodde, the western entrance point of the fjord, and has depths greater than 30 feet. The east channel, Grydelob, leads over the dangers between Bjorno and the mainland northeastward and has a least depth of 12 feet.

Dyreborg, a fishing harbor, lies in the western approach to the fjord.

The port of Faaborg lies in the northern part of the fjord and has a least depth of 17 1/2 feet in the entrance channel. The channels in the western approach and in the fjord as far as the port are indicated by lighted ranges.

WESTERN APPROACH TO FAABORG FJORD.—Knastegrund, the principal danger in this approach, is described in section 3E-5.

Lillegrund, a rocky area with a least depth of 3 feet, and Knoldhjorne, on which

there is a rock with a depth of 8 feet, lie on the shorebank that extends about 1 1/4 miles east-southeastward from Knolden. An 11 3/4-foot patch lies close eastward of Knoldhjorne. Four buoys mark Lillegrund and two buoys mark the south side of Knoldhjorne. A buoy and a perch mark the edge of the steep-to shorebank close northward of Knoldhjorne. A light buoy is moored eastward of the 11 3/4-foot patch.

A channel with a least depth of 21 1/4 feet leads between Lillegrund and the 11 3/4-foot patch. The fairway is indicated by a pair of lights in range 353° on Sisserodde, located less than 1 mile northeastward of Knolden.

Dyreborg lies in the small bight between Knolden and Sisserodde. The harbor consists of a single small basin with a depth of 2.5 m (8.2 ft.). Easterly winds may raise the water level up to 4 feet and westerly winds may lower it the same amount. There is good anchorage for small vessels off the harbor in 6.5 to 7.5 m (21.3 to 24.6 ft.), good holding ground.

Bjorno, a bare hilly island 79 feet high, is fronted on the southwest side by a steep-to shorebank; the 5-fathom curve is nowhere more than about 300 yards offshore. A light is shown on the south side of the island, and a buoy is moored on the shorebank about 1/4 mile westward of the light. A buoy is moored about 1/2 mile southwestward of the light.

The west channel leading into Faaborg Fjord lies between the shorebank off the northwest side of Bjorno and the steep-to shorebank extending from Sisserodde. Two light buoys moored on the edge of the shorebank off Bjorno and two buoys moored on the shorebank off Sisserodde mark the sides of the channel. A pair of lights in range 047° are located at Osterhede, about 3/4 mile southeastward of the harbor of Faaborg. This range indicates the fairway through the channel and leads to the intersection of the harbor range in Faaborg.

A submarine cable crosses the channel between Bjorno and Sisserodde; beacons mark the landing place on Bjorno.

EASTERN APPROACH TO FAABORG FJORD.—Store Svelmo and Lille Svelmo, two islets joined together, lie on the very shallow shorebank that extends southwestward from the coast of Fyn. Store Svelmo, the southern islet, is 49 feet high and has on it two prominent houses that stand close together. The shorebank that extends about 1/4 mile southward from Store Svelmo is very steep-to and consists of a sandbank that is dry almost to its outer end. The depths between Store Svelmo and the coast northward are very irregular and for the most part shallow.

Bjornholme Flak, an area of foul ground consisting of shoals, reefs, and a long narrow ridge that dries, extends about 2/3 mile southeastward from the southeastern end of Bjorno. A buoy is moored on the outer end of the shoal area.

Another foul area with rocks and shoals extends northeastward from the southeastern end of Bjorno to the coast of Fyn.

Hanse Bugt, with general depths of 5 to 7 1/2 fathoms, lies between Bjornholme Flak and the foul area northward and the coast of Fyn. The coast on the east side of the bay is low and has a few low green cliffs. A firing area is located in the western part of Hanse Bugt and extends about 1 mile southeastward of the southeastern end of Bjorno.

A submarine cable crosses the northwest part of Hanse Bugt; beacons on the Fyn coast indicate the landing place of the cable.

Grydelob, the east channel leading into Faaborg Fjord, is approached through Hanse Bugt and is entered nearly 1 mile northeastward of the southeast end of Bjorno. The channel passes over the deepest part of the last-mentioned foul area, and its sides are indicated with four buoys.

FAABORG FJORD.—The fjord has low shores except for some bluffs on the southeastern side, and there are some hills a short distance inland. Several of the buildings in the town of Faaborg stand out prominently. The town of Bjorno, off which there is a

landing pier with a depth of 2.0 m (6.5 ft.) at its outer end, is located on the northeast side of Bjorno.

The depths in the fjord are very irregular and there are several detached dangers. In general there are depths of 6.2 to 14.0 m (3.3 to 7.6 fm) in the outer part of the fjord and much less in the inner part.

In the southern part of the fjord the main danger is Diernaes Grund, a 10-foot shoal located about 3/4 mile eastward of the northern end of Bjorno. A buoy is moored on the eastern side of this shoal.

A 5.6 m (18.3 ft.) rocky patch lies on the range line of the west channel in a position nearly 1/2 mile northeastward of the north end of Bjorno.

Hojen, a 2.5 m (8.2 ft.) patch with a buoy on its north side, is the outer end of a ledge that extends about 1/2 mile from the west side of the fjord. A buoy is moored close eastward of Hojen.

Sletron, a rock that sometimes dries, lies about 1/3 mile southwestward of Faaborg harbor entrance. A buoy is moored on the east side of this danger.

The above-mentioned dangers lie in or near the fairway to the harbor. There are several other detached dangers interspersed throughout the fjord.

Several cables are laid across the outer part of the fjord. Beacons on Bjorno indicate the direction of the cable.

The entrance channel to the harbor leads eastward of Hojen and over a bar with a depth of 17 1/4 feet in the fairway. A pair of lights in range 336 1/2° are located in the harbor and indicate the fairway of the entrance channel from the intersection of the range on Osterhede.

ANCHORAGES.—There is anchorage in 4 to 6 fathoms in the northern entrance of the west channel. There is anchorage for small vessels in 5.0 to 6.0 m (2.7 to 3.2 fm) off the harbor entrance.

FAABORG

Position: 55°06'N., 10°15'E.
 Depth: Entrance channel, 5.3 m (17.3 ft.).
 Outer harbor, 1.7 to 5.6 m (5.5 to 18.3 ft.).
 Inner harbor, 2.8 to 5.8 m (9.1 to 19.0 ft.).
 Ferry harbor, 4.5 m (14.7 ft.).
 Tidal range: Negligible.
 Port plan: See "FACILITIES."

3E-7 The port of Faaborg is an artificial harbor lying adjacent to the town. The harbor consists of a main basin, divided into an inner and outer harbor by a mole and a T-shaped pier, and a small ferry harbor close eastward of the main basin.

The entrance to the main harbor is about 100 feet wide between the breakwaters and has a least depth of 6.0 m (19.6 ft.). The outer harbor is irregularly shaped and has depths of 4.8 to 5.6 m (15.7 to 18.3 ft.) at the two quays on its eastern side. The west side of the outer harbor has depths of 1.7 to 5.0 m (5.5 to 16.4 ft.) alongside the breakwater. The inner harbor has depths of 2.8 to 5.8 m (9.1 to 19.0 ft.).

The ferry harbor is entered close southward of the main basin and has a depth of 4.5 m (14.7 ft.) in the fairway. It is the northern terminus of the Mommark-Faaborg ferry service. A light is shown on the head of the mole of this harbor. Another light is shown eastward of the ferry harbor.

Water level.—In calm weather there is no variation in the water level. Northeasterly winds may raise the water level as much as 2 feet and northwesterly winds may lower it the same amount.

Pilots for Faaborg must be obtained from the Svendborg Sund station (see sec. 2D-11).

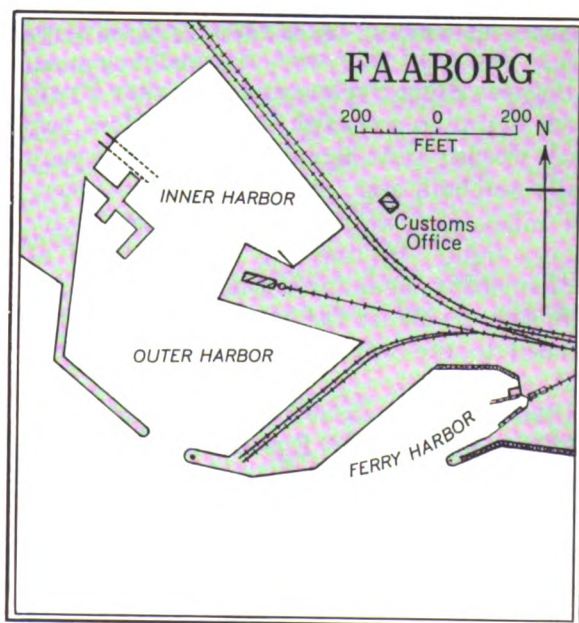
Directions.—Vessels bound for Faaborg from the westward can approach the west channel by passing between Lillegrund and Knoldhjørne in a very narrow channel with a depth of 21¼ feet or between Lillegrund and Bjørnø where the depths are greater.

Vessels having arrived at a position close southeastward of Knastegrund (sec. 3E-5) and having chosen the 21¼-foot channel should

steer 353° on the range on Sisserodde for the entrance of the west channel where the range on Østerhede is intersected. Thence vessels should steer 047° on the latter range through the narrow fairway in the west channel to a position nearly 1 mile south-southeastward of the harbor entrance where the harbor range will be intersected. Thence vessels should steer 336° on the harbor range to the entrance of Faaborg. The latter course passes close eastward of Højen.

Vessels intending to pass between Bjørnø and Lillegrund should continue on the northeasterly course given in section 3E-5 until Horne Church comes in range 321° with the west end of a high light-colored cliff east of Dyreborg. Thence vessels should steer on the latter range to the entrance of the west channel, from whence the above directions should be followed.

FACILITIES.—Faaborg, a town with a population of 5,997 (1965) is a commercial center for the surrounding agricultural area. The town is engaged in dairying, meat canning, and the manufacture of agricultural machinery. Coal, grain, fertilizer, fodderstuffs, and lumber are the principal imports. Meat and dairy products are the main exports. The customhouse is located near the inner harbor.



The outer harbor has two berths, 360 and 400 feet in length, on the southeast side of the basin. The shorter berth has 4.8 to 5.6 m (15.7 to 18.3 ft.) and the other 5.4 m (17.7 ft.) alongside. The west side of the harbor is used by fishing boats.

The inner harbor has one berth about 500 feet long with a depth of 4.9 m (13.1 ft.) and other berths with lesser depths and lengths. The T-shaped pier on the west side of the harbor has a face about 140 feet in length and is used as a landing stage.

The larger berths in the harbor are served by the railroad. There is a 6-ton crane in the inner harbor.

Provisions and water are available. Minor repairs can be effected. The small shipyard on the northwest side of the inner harbor has a small marine railway with a lifting capacity of 50 tons.

MAIN FAIRWAY SOUTH OF FYN (Continued)

3E-8 The channel in the main fairway between a position off Avernakø and the entrance to Svendborg Sund is clear of detached dangers and has general depths of $6\frac{1}{2}$ to $12\frac{1}{2}$ fathoms. Except for Nakkebølle Fjord, the coast of Fyn is fairly steep-to. On the south side of the channel the shoals are more extensive.

The western part of Svendborg Sund as far as the port of Svendborg, a distance of about 4 miles, is described herein. The fairway in the outer 2 miles of the sound is fairly wide and has depths greater than 5 fathoms. Then the channel narrows considerably and the depths become critical. A least depth of 6.3 m (20.6 ft.) is found in this part of Svendborg Sund.

Between **Store Svelmø** and **Lehnskov Pynt**, about $6\frac{1}{2}$ miles eastward, the coast is low, has small wooded areas here and there, and is generally well built over. A river discharges about $1\frac{3}{4}$ miles northwestward of Lehnskov Pynt. Range lights, in line 018°, are located at Ballen, about one mile west-northwestward of Lehnskov Pynt. At Lehnskov Pynt, which is wooded to the water, there is a prominent cliff.

Ulbølle Church, about 4 miles northeastward of **Store Svelmø**, and **Egense Church**, about $1\frac{3}{4}$ miles north-northeastward of **Lehnskov Pynt**, are prominent landmarks.

Nakkebølle Fjord indents the coast between **Store Svelmø** and a point about 3 miles east-

ward and is almost completely encumbered with shoals. **Fjellebro Havn**, consisting of a small basin with depths of 1.8 to 3.1 m (5.9 to 10.1 ft.), lies on the northeast side of the fjord. The entrance to the basin is only about 35 feet wide. A narrow and winding channel, over 33 feet deep at its outer end, leads to the harbor; the channel is marked with buoys. There are no pilots, but a resident with local knowledge will conduct vessels to the harbor.

The shorebank on either side of the entrance to the fjord extends nearly 1 mile offshore and is very steep-to. Buoys mark the outer end of these shoals.

Between **Avernakø** and **Taasinge**, about $6\frac{1}{4}$ miles eastward, there is an extensive shoal area on which lie several islands and through which lead several minor channels. **Flæskholm** and **Skarø** are the northern islands; **Drejø**, **Hjortø**, and several other islands lie on the southern part of the shoal. The latter islands are described in sections 3E-10 and 3E-13.

Flæskholm, a small islet about 1 mile eastward of the eastern extremity of **Avernakø**, lies on **Flæskholm Flak**. The northern part of this shoal lies nearly 1 mile northward of the islet and is very steep-to. A buoy is moored in about $11\frac{1}{2}$ feet of water on the northern part of the shoal.

Skarø, a low bare island with a small town and some isolated houses, lies about $\frac{3}{4}$ mile westward of **Taasinge**. The outermost part of the shoals surrounding the island extends nearly $\frac{1}{2}$ mile northward and northeastward from the northern tip of the island. A buoy is moored in a depth of $18\frac{1}{2}$ feet on the northeast side of this shoal area. On the north side of the island there is a pier with a depth of $8\frac{1}{2}$ feet at its head.

Two submarine cables cross the main fairway from **Skarø** to **Lehnskov Point** and **Ballen**. Range beacons on both shores indicate the direction of the cable.

Højestene Løb, entered between **Skarø** and **Taasinge**, is described in section 3E-13.

3E-9 Svendborg Sund is entered between Lehnkov Pynt and Vornæs Pynt ($55^{\circ}01' N.$, $10^{\circ}31' E.$), the northwest point of Taasinge. It leads northeastward about $4\frac{1}{2}$ miles between Taasinge and the coast of Fyn to the harbor of Svendborg where it turns sharply southward and follows a winding course an additional $3\frac{1}{2}$ miles to the open water that leads to Store Bælt.

Both shores of the sound are fairly low and there are several small wooded areas near the coast. The prominent features on Fyn are the two churches in Svendborg and St. Jørgens Church, located near the shore a short distance southwestward of the town. On Taasinge, Bregninge Church with its tall spire and Bregninge Mill, close northeastward, are conspicuous landmarks; both are located on the 242-foot summit nearly $3\frac{1}{2}$ miles east-northeastward of Vornæs Pynt.

In the entrance a **light** is shown on the south shore close westward of Bækkehave, located about 1 mile northeastward of Vornæs Pynt. On Vornæs Pynt there is a pair of **range beacons** used for transiting Højstene Løb. A **buoy** is moored in a depth of 26 feet a short distance northwestward of the point and marks the edge of the shorebank.

The **channel** in the entrance is wide and deep. From about 1 mile inside the entrance the shorebanks become more extensive and narrow the fairway considerably. Ilholm, a small islet 18 feet high, stands on the south shorebank. **Buoys** mark the edge of the shorebank northward and southwestward of Ilholm.

From abreast Ilholm to Svendborg the fairway is divided into five reaches over a distance of about $2\frac{1}{4}$ miles. The first reach is indicated by a sector of the **light** near St. Jørgens Church and the other reaches are indicated by **lighted range beacons** at Tankefuld, Bratten, and Ørerne. **Buoys** are also moored on both sides of the fairway.

The most critical part of the fairway is in the third reach where a portion of the channel is dredged to a depth of 6.3 m

(20.6 ft.). Vessels with a draft of $21\frac{1}{4}$ feet can, with the aid of a pilot, traverse this reach. This reach is indicated by a pair of light beacons in range 068° at Bratten.

Ørerne is the northern extremity of Taasinge, and Bratten, a wooded area, is located about 1 mile west-southwestward of Ørerne.

A fixed highway bridge, with a vertical clearance of 108 feet, crosses the sound at Bratten.

Submarine cables cross the sound at several places. **Lighted and unlighted range beacons** mark some of the landing positions of these cables.

There is a **ferry crossing** between Vindeby, a ferry harbor on Taasinge, and Svendborg.

Pilots are available at Tankefuld, a wooded area on the north shore about 2 miles northeastward of Lehnkov Pynt.

Anchorage.—There is anchorage anywhere in the fairway between Avernakø and Svendborg Sund.

Directions.—From a position about midway between Store Svelmø and Nakkeodde, vessels should steer in the middle of the fairway by alining Lehnkov Pynt in range 089° with Bregninge Mill until a position north-northeastward of Skarø is reached. Thence vessels should steer east-southeastward to a position in the sound entrance about $\frac{1}{4}$ mile southward of Lehnkov Pynt. When St. Jørgens Church is in range about 059° with the middle of a high wood located eastward of Svendborg, vessels should steer for it until the pole beacons at Tankefuld are in range 269° . Thence vessels could be guided by the ranges and buoys in the remaining four reaches of the fairway.

The port of Svendborg and the eastern part of Svendborg Sund are described in sections 2D-9 through 2D-12.

NORTHEAST SIDE OF ÆRØ

3E-10 The northeast side of Ærø between Skjoldnæs (sec. 3D-10) and the eastern end of the island is about 14 miles long. The northern part of this side of the island trends rather

regularly southeastward for about 8 miles. With the exception of Billes Grunde and several detached patches, there is fairly deep water between this side of the island and the islands of Avernakø and Drejø. The remaining part of this side of the island is very irregular and is fronted by the extensive shoals and off-lying islands that comprise in part the central shoals between Ærø and Taasinge.

The small ports of Søby and Ærøskøbing are approached through the above-mentioned deep water. The two approach channels to the port of Marstal, one from the southward through Marstal Bugt (sec. 3D-10) and the other from the northward, are more intricate because they follow a rather circuitous course through the above-mentioned central shoals. The passage to Marstal from the northward is through Mørkedyb, which is described in section 3E-13 and which leads to a pool southwestward of Strynø; the entrance channel to Marstal is entered at the western end of this pool.

A general description of Ærø is given in section 3D-10. The prominent landmarks are the churches in Søby, Ærøskøbing, and Marstal; and Tranderup Church, in the middle of the island southwestward of Ærøskøbing. In general the north coast of Ærø slopes steeply almost everywhere and has low cliffs.

Avernakø is described in section 3E-5. Off the south side of this island the 5-fathom curve lies up to about $\frac{1}{2}$ mile offshore. A passage with a depth of 11 feet and marked by two buoys is located at the eastern end of the island and connects the main fairway with deep water southward of Avernakø.

Billes Grunde, a group of patches with depths of $1\frac{3}{4}$ to 3 fathoms, lies within about $2\frac{3}{4}$ miles southward of the narrowest part of Avernakø; the outermost danger, an 11-foot patch, lies a little over 2 miles eastward of Næbbet.

Depths between Skjoldnæs and Ærøskøbing.—A spit with depths of less than 5 fathoms extends a little over 1 mile northward from Skjoldnæs. A buoy with a radar reflector is moored off the north end of this shoal area.

Off the northeast side of the island as far as Ærøskøbing the 5-fathom curve lies in most places less than $\frac{1}{2}$ mile offshore; in Revkrog the 5-fathom curve lies in some places nearly $\frac{3}{4}$ mile offshore.

Two detached patches with depths of $22\frac{1}{2}$ and $23\frac{1}{2}$ feet lie about $1\frac{1}{4}$ miles offshore in the northern approach to Revkrog. A detached patch with a depth of $24\frac{1}{2}$ feet and a 20-foot patch lie in the entrance of the bay.

The general depths between Ærø and Avernakø and the shorebank off Drejø are 5 to 21 fathoms.

Buoys.—Four buoys mark the fairway from northward of Skjoldnæs to the entrance of Højstene Løb and Mørkedyb. The westernmost buoy with a radar reflector is moored between Næbbet and Billes Grunde and the easternmost buoy is moored a little over 1 mile southeastward of the south point of Drejø. Another buoy is moored in a depth of 4 fathoms nearly 2 miles southward of Drejø. Næbbet is the northeast point of Skjoldnæs.

Søby.—The port of Søby is located about 2 miles southeastward of Næbbet and is formed by three moles, an eastern, a western, and inner western mole. There are depths of 11 feet in the entrance channel, which is liable to silting, and depths of 11 feet in the outer basin, and 10 feet in the inner basin. The entrance is narrow and is open to the northward. There is a ferry slip in the harbor. Northeasterly and easterly gales may raise the water level 4 feet and southwesterly and westerly gales may lower it the same amount. A pilot is available. Water and provisions can be obtained. There is a boatbuilding yard with a small marine railway that will take vessels up to 150 tons and a machine shop in the port.

A light is shown from the eastern side of the entrance; a fog signal is sounded when the ferry or other steamers are expected.

There is good anchorage a short distance off Soby in 7 to 8 fathoms, bottom blue clay. This anchorage is well sheltered from winds between southeast through south to west-northwest.

Revkrog is the bay that lies at the head of the indentation between a point about 3 miles southeastward of Soby and the low and irregularly shaped peninsula extending northward from AEROSKOBING. Ure Hoved is the extremity of this peninsula. The bay affords very good anchorage in 4 fathoms, bottom blue clay under a layer of mud. This anchorage is sheltered from all winds except those from the north and northwest; the latter winds may raise some sea in the bay.

DREJO, a low island located about 5 miles eastward of Skjoldnaes, is nearly divided into two unequal parts by a narrow isthmus. A 52-foot hill stands on the west end of the island; otherwise it is almost entirely flat and treeless. A village with a church is located on the eastern part of the island.

The island stands on the extensive shoal area on which are located Flaesholm and Skaro. The 5-fathom curve which contains all the dangers lies up to 1 mile off the south side of the island. Off the west side of the island and within the 5-fathom curve there is a rock with a depth of 6 feet lying about 1/2 mile offshore. A buoy is moored about 1/4 mile west-southwestward of the rock. A ledge with a depth of 11 feet at its outer end extends about 3/4 mile southeastward from the south point of the island. A buoy with a radar reflector is moored in a depth of 19 feet at the outer end of the ledge.

A small harbor on the northern side of the island is approached through an entrance channel having a depth of 1.8 m (5.9 ft.); depths in the harbor are 1.4 m (4.5 ft.).

On the southeast side of the island there is a pier about 820 feet long with a depth of 3.0 m (9.8 ft.) at its head and 3.5 m (11.4 ft.) in the ferry slip on the northern side of the

pier. A light is occasionally shown from the pierhead. East to northeast winds may raise the water level up to 8 1/4 feet and west to southwest winds may lower it up to 6 feet.

Submarine cables are laid between Drejo and Hjorto. Beacons mark the landing place on Drejo.

3E-11 AEROSKOBING.—Between Ure Hoved and Ommel Hoved, the extremity of a low and irregularly shaped peninsula and located about 2 1/2 miles southeastward, there is a coastal indentation that is shallow over its greater part and in which there are three islets. The port of AEROSKOBING is situated in the northwest corner of this bay and is fronted by an islet named Dejro. There are two approach channels to the port, one on either side of Dejro.

The harbor consists of an enclosed basin formed by moles and has an entrance, open to the northward, that is about 50 feet wide. There are depths of 3.8 to 5.0 m (12.4 to 16.4 ft.) in the basin. The ferry slip is outside the basin and adjacent to the north mole.

Mollegab, the western approach channel, is narrow, winding, and has depths greater than 5 fathoms as far as the deeper dredged entrance channel. A bell buoy moored nearly 1/2 mile northward of Dejro marks the entrance to this channel. Other buoys mark the sides of Mollegab and the two dredged entrance channels.

The western of the two dredged channels has a depth of 12 1/2 feet over a width of 65 feet and is indicated by a pair of lights in range 198° in the harbor. The other dredged channel is entered from the inner end of Mollegab and has a depth of 16 1/2 feet over a width of 82 feet. Both channels converge at the harbor entrance.

A light is shown on the east mole of the harbor entrance.

The channel eastward of Dejro has a least depth of 12 feet and is entered about 1/4 mile eastward of the northern end of this islet. The

buoy moored on the east side of the channel entrance also marks a rock with a depth of 9 feet that lies on the extremity of the shore-bank extending from Ommel Hoved.

A submarine cable from AEROSKOBING to TAASINGE is laid across the bay southward and eastward of DEJRO. A pair of beacons close southward of the town indicate the direction of the cable.

A pilot is available. Special regulations for navigation (sec. 1-39) are in force in the western channels leading to the harbor. Anchorage is prohibited in the western channels. Local knowledge is essential for entering the harbor by either channel.

Northeast to east gales may raise the water level up to 4 feet and southwest to west gales may lower it the same amount.

The town of AEROSKOBING is the western terminus of the AEROSKOBING-DREJO-SVENDBORG ferry and has a population of 1,228 (1965). The town is engaged in building small vessels. The customhouse is located near the harbor basin. At the shipyard there is a machine shop and a marine railway with a lifting capacity of 350 tons. There is a 6-ton crane at the shipyard. Provisions and water are obtainable.

OMMEL-KRAGNAES harbor is located in the small inlet on the southeast side of the coastal indentation between URE HOVED and OMMEL HOVED. In 1960 the inlet was closed and the navigational aids removed.

Between Ommel Hoved and Marstal, about 3 1/2 miles southeastward, the coast is fronted by an extensive shoal area that extends eastward and northeastward toward the coasts of Langeland and Taasinge, being interrupted only by a part of Morkedyb, a deep off the southwest end of Taasinge, and the pool southward of Stryno. Halmo, an island with a low cliff at its eastern end, is located a few hundred yards eastward of Ommel Hoved. A farmhouse stands in the middle of the island.

3E-12 MARSTAL (54° 51' N., 10° 31' E.) is a small port. The harbor consists of wharves fronting the town for a distance of about 3/4 mile and several small basins. The greater part of the harbor is sheltered by a detached breakwater, about 1/2 mile long, that lies about 100 to 200 yards offshore. Between the breakwater and the wharves there are several rows of mooring posts. The depths alongside the wharves and in the channel running parallel to the wharves are 3.0 to 4.0 m (9.8 to 13.1 ft.); there are lesser depths in the small basins and off the breakwater.

The entrance to the sheltered part of the harbor lies between the north end of the breakwater and a short mole and is only about 65 feet wide. There is a ferry slip northward of the mole, and further northward there is a shipyard.

The port is approached from northward through Morkedyb, from the eastward through Rudkobing Lob and the pool southward of Stryno, and from the southward from Marstal Bugt through Klordyb. Morkedyb (sec. 3E-13) has a least depth of 10 1/2 feet and Rudkobing Lob (sec. 2D-13) has a least depth of 3.5 m (11.4 ft.).

The north entrance channel is dredged to a depth of 3.8 m (12.4 ft.) and consists of two reaches, both of which are marked with buoys and by two pairs of range lights. The outer reach is marked by a pair of lights in range 255° located about 1/2 mile northwestward of the harbor. The entrance of the outer reach is marked by a bell buoy moored about 2 1/3 miles east-northeastward of the lighted range beacons. The inner reach is indicated by a pair of lights in range 180° located in the harbor. At the junction of the two reaches there is a bell buoy.

The fairway from the southern end of Morkedyb leads south-southwestward and joins the entrance channel in the vicinity of

the junction of the two reaches. The fairway from Rudkobing Lob enters the channel about 2 miles east-northeastward of the harbor.

Klorydyb is normally about 7 3/4 feet deep but is subject to silting. The entrance to this channel in the northern part of Marstal Bugt is marked by a buoy (sec. 3D-10). The fairway to the harbor is winding and joins the north channel at the northern end of the harbor.

Northeast to east gales may raise the water level as much as 4 feet and southeast gales, and sometimes south to southwest gales, lower it the same amount.

PILOTS are available and will take vessels westward to the channel between Skjoldnaes and Lyo, to Faaborg Fjord and the western entrance of Svendborg Sund, and southward to Marstal Bugt. Vessels desiring a pilot at the northern entrance of Morkedyb should make advance arrangements.

DIRECTIONS FOR MARSTAL.—The directions for the approach to as well as the fairway in Morkedyb are given in section 3E-13.

Vessels having arrived at the southern end of Morkedyb should alter course to align Marstal Church bearing 207° and the southern extremity of Grensholm bearing 027°, and steer with this alignment until the range (255°) of the outer reach of the north channel is intersected. Thence vessels should steer in on this range until the harbor range (180°) is intersected at a position near the bell buoy. Vessels should then alter course to this range and steer for the harbor entrance.

The town of Marstal has a population of about 4,241 (1965). Small wooden and steel vessels are built here. Provisions and water are obtainable. A marine railway with a lifting capacity of 450 tons is available at one of the shipyards. There is a 13-ton crane here. Small repairs can be effected.

MINOR FAIRWAYS AND CENTRAL ISLANDS

3E-13 HOJESTENE LOB provides access from the western end of Svendborg Sund to the deep water southward of Drejo. It is a dredged channel, about 2 1/2 miles long, with a depth of 12 1/2 feet over a width of about 100 feet. The channel is entered southwestward of Vornaes Pynt, leads southwestward over the shoal-encumbered area between Drejo and Taasinge, and enters the deep water southward of Drejo. The southern part of the channel lies between Drejo and Hjorto; the latter lies nearly 1 mile eastward of Drejo and has several farms on it.

The channel is marked with buoys, some of which are lighted periodically. The pair of beacons on Vornaes Pynt in range 040° indicate the fairway of the channel; the beacons are lighted when the light buoys are extinguished or removed.

The west and south sides of Taasinge are rather low. On the southwest point of the island there is a hillock, about 26 feet high, that has a steep cliff on its south side. Vornaes Havn lies at the head of a small bight that is entered about 3/4 mile southward of the extremity of Vornaes Pynt. The harbor is no longer used (1963).

Several small islands lie between the west side of Taasinge and Hjorto.

Knudedyb is a narrow and winding channel that lies close off the west side of Taasinge and leads almost to the northern end of Stryno. Only the northern part of the fairway that leads to Hojestene Lob is used for navigation; here there are depths up to 7 1/2 fathoms.

MORKEDYB is entered about 1 mile southward of Hjorto and leads southeastward about 5 1/2 miles to the pool southwestward of Stryno. It passes between Store Egholm and

Birkholm and westward of Bredholm and Grensholm. The channel has steep sides and is quite narrow. There are depths of over 5 fathoms as far southward as a position westward of Graesholm but farther southward they decrease gradually. The least depth in the channel, 10 1/2 feet, lies westward of Grensholm.

The entrance buoy is moored nearly 1 mile south-southwestward of the southern end of Hjorto. The channel is marked on its west side with buoys; it is only at the southern entrance to that channel that buoys are moored on both sides.

The submarine cable from AEROSKOBING to TAASINGE crosses the channel westward of Birkholm; range beacons on the north end of Birkholm indicate the direction of the cable.

ISLANDS IN THE VICINITY OF MORKEDYB.—Birkholm lies on the east side of the northern entrance of the channel and is the largest island of the group adjacent to the channel. All the islands are low. The island is inhabited and has a shallow harbor on its southwest side. At the harbor, northeast winds may raise the water level as much as 3 1/4 feet and southwest winds may lower it by the same amount.

Store Egholm with Lille Egholm close southeastward are the only islands on the southwest side of the channel. The larger island lies about 1/2 mile southwestward of Birkholm.

Graesholm, Bredholm, and Grensholm, all small islands, lie in that order on the east side of the channel between about 3/4 mile and 2 miles southeastward of Birkholm. A small cay lies between Graesholm and Bredholm.

DIRECTIONS FOR MORKEDYB.—To approach the northern entrance of Morkedyb from the deep water southward of Drejo, vessels should steer in with the southwest point of Tassing in range about 094° with

Rudkobing Church as far as the entrance buoy. Thence vessels should alter course to the southeastward and steer in the buoyed channel westward of Birkholm, thence continue southeastward through the buoyed fairway.

STRYNO, the largest island of the group lying on the extensive shoal area between the southeast part of AERO and TAASINGE lies about 3 1/2 miles northeastward of the port of Marstal. The island is fairly low, being only about 33 feet high, and is well built over. A village with a church is located in the middle of the island and a windmill stands near the shore on the west side of the island. A pier, with a boat harbor nearby, extends from the east side of the island; there is a depth of 3.3 m (10.8 ft.) at the pierhead.

Stryno Kalv, a small island with two farmhouses on it, lies about 1/2 mile westward of Stryno. Two islets lie off the northwest side of Stryno.

A bell buoy, painted black, and a lighted buoy are moored about 1/2 mile southward of Stryno. A buoy is also moored about 2/3 mile eastward of the pierhead on Stryno. These three buoys indicate the west and north sides of the fairway from Rudkobing Lob toward Marstal and Morkedyb.

The pool between the shoals off Marstal, Stryno, and Langeland has regular depths of 12 to 21 feet over a bottom of sand and seaweed, with clay in a few places. There is good anchorage everywhere in this pool.

WEST SIDE OF LANGELAND

3E-14 The west side of Langeland between Rudkobing and Ristinge Hale, about 7 miles south-southwestward, is described herein. Rudkobing Lob, the port of Rudkobing, and

the coast northward are described in sections 2D-13, 2D-14, and 2D-7.

Between Rudkobing and Lindelse Nor, about 2 1/4 miles south-southwestward, the coast is fronted by shoals that extend to Taasinge and through which Rudkobing Lob passes. A short distance inland there are some large wooded areas.

Lindelse Nor, which is used only by fishing boats, is encumbered for the most part with islets, rocks, and shoals. The entrance to this bay is about 1 mile wide. A narrow pool over 1 mile long and with depths of 15 to 20 feet lies in the middle of the bay.

Between Lindelse Nor and Ristinge Halvo, about 3 1/4 miles southward, there are only a few small wooded areas. Lindelse Church and Humble Church, located about 2 1/4 miles east-southeastward and about 3 1/4 miles south-southeastward of the southern entrance of Lindelse Nor, are prominent landmarks.

RISTINGE HALVO is a peninsula that extends about 1 3/4 miles west-northwestward from Langeland and has Marstal Bugt on its south side. Ristinge Hale is the low and nar-

row strip of land at the outer end of this peninsula.

The village of Ristinge is located near the inner end of Ristinge Halvo. Close northward of the town there is a pier with a depth of 8 feet alongside. The channel to this pier has a depth of 8 feet over a width of about 40 feet and is marked with buoys.

Ristinge Lob, a shallow channel with a least depth of 2 feet, leads from Marstal Bugt between Ristinge Hale and an islet northwestward to the deep water of the pool southward of Stryno.

ANCHORAGES

3E-15 Lyo.—See section 3E-5.

Avernako.—See section 3E-5.

Dyreborg.—See section 3E-6.

Faaborg Fjord.—See section 3E-6.

Between Avernako and Svendborg Sund.—See section 3E-9.

Soby.—See section 3E-10.

Revkrog.—See section 3E-10.

South of Stryno.—See section 3E-13.

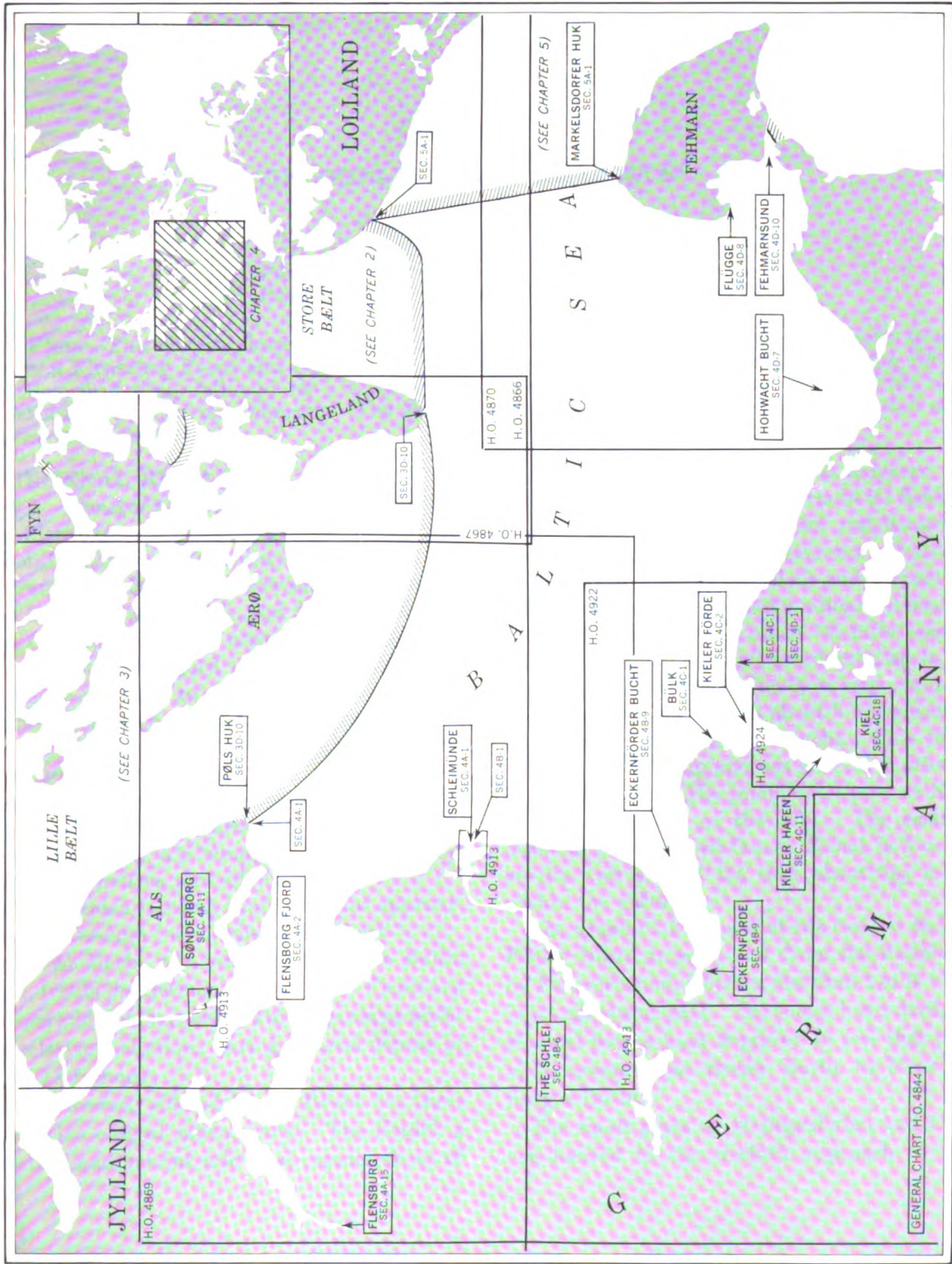


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 4—GRAPHIC INDEX

CHAPTER 4

FLENSBORG FJORD AND KIELER BUCHT

Part A. Flensburg Fjord

Part B. Flensburg Fjord to Kieler Förde

Part C. Kieler Förde

Part D. Kieler Förde to Fehmarnbelt

Plan.—This chapter describes Flensburg Fjord in its entirety and the shores of Kieler Bucht between Flensburg Fjord and Fehmarnbelt. The Danish and German shores of Flensburg Fjord are described first, followed by a description of the German coast between Schleimünde and Markelsdorfer Huk, on Fehmarn. The sequence of the description is from north to south and thence from west to east.

GENERAL REMARKS

4-1 Flensburg Fjord, known to the Germans as Flensburger Förde, is one of the largest coastal inlets in the western Baltic Sea. The entrance to this fjord is between Pøls Huk, on the Danish island of Als, and Schleimünde, on the German Schleswig coast about $12\frac{1}{4}$ miles southward. The fjord is about 28 miles long from its entrance to the head and is very irregularly formed. The German port of Flensburg lies at the head of the fjord and is reached through an intricate channel. The fjord also provides access through Sønderborg Bugt to the Danish port of Sønderborg which lies at the southern end of Als Sund, the latter emptying into the northern part of the bay.

The Danish-German boundary runs approximately through the middle of the fjord.

Kieler Bucht, the western end of the Baltic Sea, fronts the German coast between Flensburg Fjord and Fehmarnbelt. This expanse of water is relatively shallow, having general depths of 5 to 13 fathoms.

The western side of Kieler Bucht has three extensive coastal indentations. The Schlei, a shallow and narrow inlet that recedes about 20

miles southwestward from its entrance at Schleimünde, has two small ports in it; Schleswig lies at the head of the inlet and Kappeln lies about 4 miles within the entrance. Eckernförder Bucht, the most spacious and deepest of the three bays, recedes about 9 miles west-southwestward from the coast about $7\frac{1}{4}$ miles southward of Schleimünde and has depths up to 14 fathoms. Kieler Förde, the most important of the three inlets, is entered about 3 miles southeastward of Eckernförder Bucht. This inlet is about 7 miles long and has general depths of 6 to 10 fathoms. The commercial port of Kiel occupies the head of the inlet. The eastern terminal of the Nord-Ostsee Kanal is located on the west side of the inlet about $5\frac{1}{2}$ miles within the entrance.

The island of Fehmarn at the eastern end of Kieler Bucht is separated from the mainland by Fehmarnsund, which is less than 1 mile wide in its narrowest part. The sound has a dredged channel with a least depth of 19 feet that provides access from Kieler Bucht to Mecklenburger Bucht.

The small ports of Heiligenhafen and Orth are located in the western approach to this

channel; the latter port being on Fehmarn and the former on the mainland.

The coastal terrain can be characterized as follows: The outer coast is for the most part low. There are bluffs here and there that alternate with gradual slopes and, in some places, low swampy areas. A sandy beach fronts the entire coast. Dikes protect the low marshy areas. In places the coast is backed by sand dunes and farther inland there is rolling terrain, either cultivated or wooded, and small lakes and marshes. In the fjords the shores generally rise in steep or gently sloping earthy cliffs.

Mariners are advised to exercise caution when navigating in this area and to adhere to NEMEDRI instructions. However, this area is fairly well built up and is not lacking in navigational aids. Dangerous wrecks are marked with navigational aids. Other known wrecks and foul patches consisting of remains of wrecks are charted. The shallowness of this part of the Baltic Sea places an additional burden on the navigator of an average-size vessel.

WATER LEVEL

4-2 Since the tidal range in these waters is imperceptible, its influence on the fluctuation of the water level is negligible.

In the Baltic Sea proper the land drainage due to rains and melting snow is greatest in the spring. However, the water level does not reach its maximum during this season, as expected. In fact the lowest water level occurs during April and May and the highest during August and September. The cause of this phenomena may be attributed to the prevailing winds over the North Sea and Baltic Sea area which are easterly during March, April, and May and westerly beginning at the end of June

or early July. During April and May the water level falls from 6 inches to 1 foot below the mean level and during September it may rise 6 to 8 inches above the mean level. During the late fall and winter when easterly and westerly winds alternate the water level rises as high as its mean level.

In the western part of the Baltic Sea, the conditions are somewhat different. Strong winds from the southwest through the west to the northwest over the North Sea and Baltic Sea dam up the water in the Kattegat and raise the water level there. These same winds, particularly those from the southwest to west, drive out the water from the western part of the Baltic Sea toward the middle part of this sea, thereby lowering the water level in the former place.

Strong winds from the northeast to east over the North and Baltic Seas drive the water from the middle part to the western part of the Baltic Sea and raise the water level. At this same time, however, the water level in the Kattegat is lowered.

If the wind should suddenly shift from an easterly to a westerly direction the whole southwestern part of the Baltic Sea may be exposed to a rapid rise in water level. At this time flooding may occur ashore with devastating effects. Flooding of the land because of a high water rise also occurs during very severe storms, which seldom happen. During an exceptional flood in November 1872 the water rose as high as 10 feet in places.

The water level in the open waters of the Baltic Sea may be lowered or raised as much as 3 feet but in the inner recesses of the fjords this amount may increase to 5 or 7 or even 10 feet.

CURRENTS

4-3 In brief the two predominant factors that cause surface currents in these waters are the exchange of water between the Baltic Sea

and the Kattegat and subsequently the North Sea and the prevailing winds. Since the exchange of water varies to some extent with the seasons, this has a pronounced effect on the surface movement of water. Secondly, strong winds may either increase, decrease, stop, or reverse this surface water movement. Consequently the currents may set in both directions although on the whole when it is calm or light winds are blowing the dominant set is a weak outgoing or westerly current or it may be uncertain.

Generally, strong southwest through west to north-northeast winds over the North and Baltic Seas produce an incoming flow or easterly current in this part of the Baltic Sea. On the other hand, strong northeast through east to south-southwest winds over the same areas produce an outgoing flow or westerly current in this part of the Baltic Sea.

When the winds are from directions between south-southwest to southwest and from the north-northeast to northeast, the current may be either incoming or outgoing.

The directions and velocities of the currents in this part of the Baltic Sea are shown in figures 2 through 10.

More details on currents are given in chapter 1.

ICE

4-4 Ice conditions in the western Baltic Sea are generally similar to those in the Kattegat (See H.O. Pub. No. 41). Under normal conditions the fast ice seldom extends any distance from shore, but drift ice may be of some concern to the navigator. Much of the drift ice is carried into and through Lille Bælt and Store Bælt.

When ice forms along the shores and in the inner recesses of the coastal indentations, the channels to the ports are kept open as long as the ice in the Baltic Sea is not sufficiently heavy to prevent navigation.

The first ice makes its appearance at the heads of the fjords and in the coastal lakes. Ice has been observed as early as November 16 (in the Schlei) and has remained as late as April 18 (off the northwest end of Fehmarn).

See chapter 1 for more ice information. Details of ice for individual ports are given with the respective description and in table 6 in chapter 1.

Part A. FLENSBORG FJORD (FLENSBURGER FÖRDE)

4A-1 Pøls Huk ($54^{\circ}53' N.$, $10^{\circ}04' E.$), the northern entrance point of Flensburg Fjord, and the surrounding shorebank are described in section 3D-10.

Schleimünde ($54^{\circ}40' N.$, $10^{\circ}02' E.$), located about $12\frac{1}{4}$ miles southward of Pøls Huk, is defined in this volume as the southern entrance position of Flensburg Fjord. Schleimünde is the entrance to the Schlei, which is described in sections 4B-2 through 4B-7. Two breakwaters extend seaward to protect this entrance. The coast immediately northward and southward of this entrance consists of low and sandy strips of land; the strip northward is a sandy island known as Lotsen Insel. The waterway of the Schlei lies in the background.

A wreck, swept to a depth of 19.0 m (10.3 fm), lies about $5\frac{1}{2}$ miles north-northeastward of Schleimünde.

A small harbor and several buildings, one of which is the pilots' house, are located at the southern end of Lotsen Insel near the root of the northern breakwater. A **signal station** from which storm signals are shown stands here. A **light** is shown on the head of the northern breakwater. A **fog signal** is sounded at the light. A red pole **beacon** with a cylindrical topmark and fitted with a reflector stands on the south breakwater.

A small military harbor, closed to general navigation, is located about $\frac{1}{2}$ mile southward of the entrance to the Schlei. Two moles, extending eastward about $\frac{1}{2}$ mile, shelter the harbor entrance. Two lights close southward of the harbor, in range $271\frac{1}{2}^{\circ}$, lead in through the approaches; two lights on the northern side of the harbor, in range $299\frac{1}{2}^{\circ}$, lead into the harbor; a light is shown from each side of the harbor entrance.

The shorebank as defined by the 5-fathom curve extends nearly 2 miles from the shore at Schleimünde. Several buoys are moored on this shorebank to indicate the approach channel to the Schlei.

GENERAL

4A-2 Flensburg Fjord is one of the largest fjords in the western part of the Baltic Sea. The fjord is divided into two parts at Borreshoved about 11 miles within the entrance. Each part has its own characteristics.

The outer fjord is formed very irregularly, is quite spacious, and has ample depths outside several dangers. Sønderborg Bugt, through which access is made to the port of Sønderborg, occupies the greater part of the northern side of the outer fjord. Geltinger Bucht, a well-defined bay, lies on the less irregular southern side of the outer fjord.

The inner fjord is comparatively narrow within Borreshoved, being a little over 2 miles at its maximum width, and continues in four reaches to the port of Flensburg at the head of the fjord. In the extreme northern part of the inner fjord there is a narrow passage, Egersund, that leads into Nybøl Nor, an inland water. Graasten, a small port, is located in a small bay on the northwest side of Egersund and the harbor of Egersund lies on the east side of the passage of the same name.

Bredgrund, an extensive detached shoal area, divides the fjord entrance into two entrance channels. The main channel leads southward and westward of this danger and the other channel lies northward of the danger. Other dangers, either extending from the shore or being detached, lie in the outer fjord, but they present no obstacles to prudent navigation.

In the inner fjord the depths become progressively lesser westward of Borreshoved and in the vicinity of the peninsula of Holnis become rather critical. The channel becomes very narrow westward of the peninsula.

The Danish buoyage system is used in the northern part of the fjord. The German buoyage system is used in the southern part of the fjord and in the approach to Flensburg; the head of the fjord lies entirely in German waters.

PILOTAGE

4A-3 Pilotage is not compulsory in either the Danish or German waters but it is advisable to engage a pilot in these waters. German pilots for Flensburg Fjord are stationed at Flensburg. Pilots are boarded about 2 1/2 miles west-northwestward of Kalkgrund Light from a pilot vessel stationed in Langballigau. Vessels in need of a pilot should give at least five hours' notice before arrival. Danish pilots are stationed at Sønderborg, Egersund, Graasten, and other Danish harbors.

Sea pilots of both nationalities may conduct vessels in the territorial waters of both countries. However, only German pilots may conduct vessels in Flensburg harbor and only Danish pilots may conduct vessels in Sønderborg and other Danish harbors.

REGULATIONS

4A-4 Except in an emergency, vessels are prohibited from lying or anchoring on or near the range lines of the range lights or white sectors of the lights.

Navigation within a distance of 220 yards of either the Danish or German coast without permission is prohibited. This regulation does not apply in the narrow channel westward of Holnis where a vessel may approach the coast as near as navigation necessitates.

FISHERIES

4A-5 See section 1-9.

DEPTHS

4A-6 In the immediate approach to Flensburg Fjord there are depths of about 10 fathoms and more outside the coastal bank. In the vicinity of Schleimünde the 10-fathom curve defining the coastal bank lies up to 4 miles off-shore.

A wreck with a depth of 11 fathoms lies about 6 miles northeastward of Schleimünde. A dangerous wreck lies about 2 1/2 miles east-northeastward of Schleimünde. Other wrecks with depths greater than 8 fathoms lie seaward of the 10-fathom curve.

In the fjord entrance as far as Kalkgrund Light (sec. 4A-9), the main channel has

depths of 13.0 to 35.0 m (7.1 to 19.1 fm) over a least width of about 3/4 mile. The channel northward of Bredgrund has a least depth of 10.9 m (5.9 fm) and is about 300 yards wide in its narrowest part. Bredgrund is described in section 4A-9.

The outer fjord and Sønderborg Bugt have general depths of 10.9 to 31.0 m (5.9 to 16.9 fm). Depths greater than 10 fathoms are found in the central parts of both waters as far as the entrance of Als Sund. There is a least depth of about 12.0 m (6.5 fm) as far as Sønderborg.

Neukirchen Grund, a steep-to rocky patch with a least depth of 2.3 m (1.2 fm), lies about 1 3/4 miles south-southeastward of Borreshoved. This dangerous detached patch is marked with a buoy.

The other dangers in the outer fjord and Sønderborg Bugt are described with the related features.

Inner fjord.—The eastern 4 miles of the inner fjord has general depths of 6 1/2 to 12 fathoms. In the remaining part of this fjord the fairway becomes narrow and the depths decrease. The channel that rounds the peninsula of Holnis has very sharp turns; the least depth on the range lines is 7.2 m (23.6 ft.). Farther southward the depths increase slightly.

Egernsund has a least depth of 7.0 m (22.9 ft.) as far as Nybol Nor, and there are general depths of 5.9 to 9.9 m (19.3 to 32.4 ft.) in this inland water.

WATER LEVEL

4A-7 Although the tidal range in Flensborg Fjord is negligible the tides are noticeable in some places. For example: Sønderborg has a mean tidal range of about 2 feet whereas Egernsund has a mean tidal range of nearly 4 feet.

The direction, strength, and duration of the wind exercise the greatest influence on water level. The ordinary variation of water level is only about 1 foot above or below the mean water level. However, winds from the easterly quadrant raise the water level and winds from the westerly quadrant lower the water level. When

winds back from south to east the water level begins to rise. Strong northeasterly winds cause the highest water level, up to 8 1/4 feet in Egernsund, and strong southwesterly to westerly winds cause the lowest water level.

ICE

4A-8 See table 6 in chapter 1 for dates on formation and disappearance of ice.

In the inner fjord, ice forms any time between the latter part of November and the latter part of January. Generally the ice does not form before the middle of January. At this time when a hard frost occurs, usually as a result of easterly winds, the fjord freezes over completely within 24 hours. With these easterly winds, ice usually forms more rapidly in the inner fjord than in the outer fjord, although in general it may be assumed that the ice forms fairly regularly over the entire fjord.

The ice begins to break up any time between the early part of January and the early part or middle of April. Generally the ice begins to thaw in the early half of March, when it melts along the shores and begins to move. Since westerly winds prevail at such times in the fjord, the ice drifts seaward over the entire fjord in very large floes. Should easterly winds set in during this time and the frost sets in again, which very often occurs, the ice drifts back again into the fjord in small floes. When this happens, ice jams form in the entrance to the narrows off Holnis and traffic is impeded.

ENTRANCE AND OUTER FJORD

4A-9 The entrance and outer fjord comprise that part of Flensborg Fjord that lies between Schleimünde and Pøls Huk, on the east, and Borreshoved and Habernis, on the west, except Sønderborg Bugt.

Bredgrund occupies a good part of the entrance southward of Pøls Huk. This shoal is roughly 3 miles in extent as defined by the 5-fathom curve and has irregular depths. A least depth of 4.3 m (14.1 ft.) is found in the central part of this shoal. Buoys are moored off the north, east, south, and west sides of Bredgrund; the southernmost buoy is a red and white whistle buoy (of the German buoyage system) moored in a depth of 7 1/2 fathoms about 5 3/4 miles southward of Pøls Huk.

Danish coast.—The coast between Pøls Huk and the southwest end of Kegnæs, about 6 1/2 miles westward, forms the north side of the entrance to the fjord. A narrow isthmus located about 2 3/4 miles west-southwestward of Pøls Huk connects the peninsula of Kegnæs to the island of Als. The coast immediately westward of Pøls Huk is marshy and Kegnæs is fairly low. A bluff about 58 feet high stands on the southeast end of the peninsula and there are elevations up to about 50 feet here and there.

Other than Pøls Rev (sec. 3D-10), the shorebank within the 5-fathom curve extends nearly 1 mile from the coast of Als and about 3/4 mile from Kegnæs. Middelgrund, a dangerous rocky patch west-southwestward of Kegnæs, is described with Sønderborg Bugt in section 4A-10.

A channel with a least depth of 6 fathoms leads between the shorebank and the northern end of Bredgrund. A buoy moored on the edge of the shorebank southward of the isthmus and the buoy moored on the northern end of Bredgrund mark the narrowest and shoalest part of the channel.

A pair of lights, one of which is described in section 3D-10, are located on Pøls Huk. In range 044° these lights indicate the fairway in the narrow part of the channel northward of Bredgrund. A light is also shown on the bluff on the southeastern end of Kegnæs.

A white church with a black roof at Lysabild, nearly 3 miles northwestward of Pøls Huk, and a white church with a red roof in the village of Kegnæs, near the southwest end of the peninsula of the same name, are conspicuous landmarks.

German coast.—The coast between Schleimünde and Birknack, about 8 3/4 miles northwestward, is low and sandy and is diked almost its entire length. Behind the dike the land is marshy and partly cultivated. Birknack is a low barren point.

All the dangers lie within the 5-fathom curve, which lies about 2 miles offshore at Schleimünde, about 1 1/4 miles off Falshöft, and less than 1/2 mile eastward of Birknack.

A triangular foul area and former ammunition dumping ground is centered about 3 miles northward of Schleimünde.

Falshoft Light is shown from a position about 2 1/2 miles southeastward of Birknack.

Kalkgrund, a spur of rock and sand having depths of less than 1.0 m (3.2 ft.) at its outer extremity, extends about 2 miles north-northwestward from Birknack. Kalkgrund Light is shown from the outer extremity of Kalkgrund; a fog signal is sounded; a radio-beacon transmits. A submarine cable, joining the light with Birknack, is laid eastward of the spur.

A white tower, located about 4 miles northwestward of Schleimünde, is conspicuous when approaching Flensburg Fjord from eastward.

Geltinger Bucht is entered between Birknack and Habernis, about 4 miles westward, and has general depths of 7.6 to 24.0 m (4.1 to 13.1 fm) between the shorebanks. Jurgens Schott, two detached patches with depths of 4.8 and 4.9 m (15.7 and 16.0 ft.), lies about 1 1/2 miles off the head of the bay in a position about 2 miles southwestward of Birknack. In the approach to the bay there is an 8.8 m (4.8 fm) patch about 2 miles northwestward of

Birknack and a 7-fathom patch about 2 1/4 miles west-northwestward of the same point. A steep-to shorebank extends nearly 1/2 mile north-northeastward from Habernis.

There is anchorage in 8 fathoms about 1 mile offshore on the east side of the bay in a position abreast the village of Bevero. Four lighted mooring buoys are moored about 2 1/2 miles westward of Birknack. The village is located about 3/4 mile southward of Birknack. Northerly winds send in a sea and render this anchorage uncomfortable for small vessels.

DIRECTIONS FOR THE ENTRANCE AND OUTER FJORD.—Large vessels should enter through the main channel southward and westward of Bredgrund.

From the southward: From a position about 3 3/4 miles northeastward of Schleimunde, vessels should steer 320° for Kegnaes Church until Dybbøl bears about 310°. Thence alter course to 310° and steer for a position about one mile north-northeastward of Kalkgrund Light. Vessels should then alter course sharply to the west-southwestward and steer for a position about 3/4 mile southward of Borreshoved.

From the northward: From a position about 2 3/4 miles southeastward of Pols Huk, vessels should steer 282° for Kegnaes Light. When Pols Huk lights are in range 044°, vessels should alter course to 224° with the latter range over the stern and steer between the buoys marking the narrow fairway of this channel. When Kegnaes Light bears 337°, vessels should alter course to 272° and steer for a position about one mile northward of Kalkgrund Light. Vessels should then alter course to west-southwestward and steer for a position about 3/4 mile southward of Borreshoved.

SONDERBORG BUGT

4A-10 Sonderborg Bugt is a very irregular bay that lies between the peninsula of Kegnaes and Borreshoved, about 4 1/2 miles west-southwestward. Als Sund with the port of Sonderborg near its southern end is entered

in the northern part of the bay. Vemmingbund, an arm of the bay, lies on the northwest end of the bay. Horuphav, an inlet about 6 miles long, lies between Kegnaes and the island of Als and is entered from the north-east side of Sonderborg Bugt.

The main entrance channel lies between Heltsbanke and Middelgrund and has depths greater than 10 fathoms.

Excepting Heltsbanke and Middelgrund, described below, and the head of Horuphav, the 5-fathom curve rounds the bay and inlets at a distance of less than 2/3 mile offshore. There are depths up to 20 fathoms in the bay proper, up to 15 fathoms in Vemmingbund, and up to 19 fathoms in Horuphav. There is a 6 1/2-fathom patch about 1 1/2 miles westward of the western end of Kegnaes, and a wreck with a depth of 11 fathoms lies a little over 2 miles southward of the town of Sonderborg.

MIDDELGRUND, a steep-to rocky patch with a least depth of 9 feet, lies nearly 1 1/2 miles southwestward of the western end of Kegnaes. A buoy is moored on the eastern side of this detached patch, and a spar buoy is moored southward of the western end of the patch. A channel with a least depth of about 6 fathoms leads between Middelgrund and the shorebank of Kegnaes.

HELTSBANKE, a detached shoal area with a least depth of 16 1/2 feet, lies with its shoalest part about 1 mile eastward of Borreshoved. A deep but narrow channel separates this shoal from the coastal ledge fringing Borreshoved. A buoy is moored off the southeastern end of Heltsbanke. Another buoy marking a submerged rock is moored close eastward of Borreshoved.

LANDMARKS.—Skelde Windmill, about 1 1/2 miles northwestward of Borreshoved, is a conspicuous landmark. Borreshoved Church, a white building with a dark roof and two tall gray spires, is located about 4 miles northwestward and is also prominent. A black belfry stands apart from the church.

Dybbol Windmill stands near the summit of a 223-foot hill about 3/4 mile westward of Sonderborg. A yellow sandstone pyramidal monument stands close southwestward of the windmill. Dybbol Church is located about 1 1/2 miles northwestward of the monument. The church in Sonderborg is conspicuous.

HORUPHAV.—There is a ferry service between the northern end of Kegnaes and the village of Horuphav, located on the opposite shore. Submarine cables, marked by a beacon on Kegnaes, cross the inlet in the vicinity of the ferry crossing. A buoy is moored on the edge of the shorebank close eastward of the northern extremity of Kegnaes.

NAVIGATION IS PROHIBITED IN HORUPHAV.

DIRECTIONS FOR ENTERING.—Vessels entering Flensborg Fjord through the main channel and having arrived at a position about one mile north-northeastward of Kalkgrund Light, given in section 4A-9, should then alter course to westward to a position southward of the western end of Middelgrund. Thence course should be altered to northwestward for about 2 miles, whence vessels steer north-northwestward for Als Sund southern entrance.

Vessels entering the fjord through the channel northward of Bredgrund and having arrived at a position about one mile northward of Kalkgrund Light, should continue on this course to a position southward of the western end of Middelgrund. Thence course should be altered to northwestward for about 2 miles, whence vessels steer north-northwestward for Als Sund southern entrance.

SONDERBORG

Position: 54° 55' N., 9° 47' E.
Depths: Approach, over 10 fathoms.
 Channel, 35 feet.
 Berths, 6 to 24 1/2 feet.
Tidal range: About 2 feet.

4A-11 The port of Sonderborg occupies the southern entrance of Als Sund. The main part of the town stands on the east side of the

sound and the principal port facilities are located here. A drawbridge crosses the sound in about the middle of the harbor and connects both parts of the town. The waterfront is low but the land rises rather steeply and most of the town lies on rounded hills up to 130 feet in height.

The northern approach to this port is described in sections 3D-12 and 3D-14.

CURRENT AND WATER LEVEL.—The current in the harbor generally sets northward and may attain a rate of 2 to 2 1/2 knots. During such times it is difficult to navigate in the harbor and through the bridge.

The mean tidal range is about 2 feet. Northeast to southeast winds may raise the water level as much as 3 1/4 feet and south-southwest to west-northwest winds may lower it the same amount.

ICE.—It is only during severe winters that ice impedes navigation in this port. See table 4 in chapter 1.

ENTRANCE.—The shorebanks on both sides of the entrance are steep-to and narrow the channel to a width of about 300 yards between the 5-fathom curves. Osterhage, the shorebank on the east side of the entrance, extends over 1 mile offshore. A light buoy with a bell buoy nearby is moored on the outer end of Osterhage. Vesterhage, marked by a light buoy at its eastern extremity, extends from the western side of the entrance.

A point with a castle on it projects westward into the sound southward of the town and further reduces the width of the fairway to about 100 yards. A small yacht harbor with a depth of 9 feet is located a short distance southeastward of the point. Two lights are located on the eastern side, and one light on the western side of the entrance northward of the yacht harbor.

HARBOR.—Sonderborg is a river-type harbor with berthing facilities along both shores over a

distance of about 1 mile. Christian X Bridge stands about $\frac{1}{2}$ mile inside the entrance and divides the port into two parts, the north harbor and the south harbor. The principal berthing facilities are along the eastern shore northward of the bridge; the remaining berths along the eastern and western shores are primarily for small vessels, fishing vessels, and small craft.

Christian X Bridge is a double bascule bridge, the opening of which lies near the western shore and has a navigable width of about 100 feet. A row of dolphins on the west side of the channel bound the north and south approaches to the bridge. The north and south ends of the row of dolphins are marked with white lights.

There are numerous dolphins interspersed on both sides of the harbor. Two mooring buoys are located on the west side of the north harbor.

A cable area, marked by notice boards, lies close northward and southward of Christian X Bridge.

A submarine pipeline, marked at both ends by lighted notice boards, is laid across north harbor.

Signals.—At night the bridge opening is indicated with red lights on the port side and green lights on the starboard side; the lights are shown from the tops and edges of the bridge piers.

Vessels intending to pass through the bridge should make the following signals when at least $\frac{1}{2}$ mile from the bridge or when it first becomes visible, and should not approach nearer than about 100 yards prior to receiving the signal for passage.

By day: The International Code flag "N" or the national flag shown at half mast on the foremast and one long and one short blast sounded on the ship's whistle.

At night: A white light shown at the bow and a similar sound signal.

The following are the answering signals from the bridge.

By day: One black ball indicates that a vessel must anchor or passage is prohibited. Two black balls indicate that southbound vessels may pass through the bridge. Three black balls in-

dicating that northbound vessels may pass through the bridge. If a blue flag is shown with the latter two signals, it indicates that the vessel will be warped through the bridge.

At night: The black balls of the above signals will be replaced with red lights and the blue flag will be replaced with a violet light.

In the event that the answering signals for bridge passage are suddenly discontinued and replaced by one black ball or one red light, accompanied by a long whistle blast, the change indicates that the bridge cannot be opened.

If signals for passage are given simultaneously from vessels approaching from northward and southward, the vessel that has the current shall have the right to pass first.

When sailing vessels and power-driven vessels approach the bridge opening from the same side, sailing vessels have precedence over power-driven vessels.

Only one vessel at a time may pass through the bridge opening.

Anchorage.—Anchoring within about 100 yards of the bridge, in the submarine cable areas, and in the fairway in the harbor is not permitted. Vessels may anchor in Sønderborg Bugt southward of the harbor entrance.

Pilots are available in the harbor.

FACILITIES.—Sønderborg, a town with a population of about 22,761 (1966), is the commercial center of a small local area. It is engaged in the manufacture of textiles, margarine, vegetable oil, and the processing of agricultural products. The principal imports are coal, oil, fertilizer, and building materials. The exports are primarily farm products. The customhouse is near the castle, and the harbor office is on the waterfront of the north harbor.

The largest quay in the port is on the east side of the north harbor. It is about 700 feet long and has a depth of $24\frac{1}{2}$ feet alongside. The coal quay lies a short distance northward and has a berthing length of about 530 feet and a depth of $21\frac{1}{4}$ feet alongside. The oil berth, an offshore wharf with a face about 260 feet long, has a depth of 23 feet alongside; it lies northwestward of the coal quay. The north harbor has other berths with smaller dimensions.

In the south harbor there are small quays and piers with depths varying from 8 to 16 feet alongside.

There is a $2\frac{1}{2}$ -ton traveling crane on the largest quay and a 3-ton traveling crane on the coal quay. A 20-ton crane is available.

The principal berths are connected with the railroad system.

Fuel oil, coal, water, and provisions are available. Tug assistance is available on prior notice. Small repairs can be effected. A diver is available. There are two marine railways with lifting capacities of 100 to 500 tons.

The town is connected to the general telephone, telegraph, and railroad systems. There is regular steamer communication with nearby ports, including Kiel. Hospital facilities are available.

INNER FJORD

4A-12 The inner fjord is entered between Borreshoved and Habernis and continues westward round the peninsula of Holnis to the port of Flensburg, a distance of about 15 miles. The fairway that rounds Holnis is somewhat intricate but it is adequately indicated with navigational aids.

Eastern part of the inner fjord.—Between Habernis and the peninsula of Holnis, the inner fjord has ample depths. The 5-fathom curve lies less than $\frac{1}{2}$ mile off the German coast and up to a little more than $\frac{1}{2}$ mile off the Danish coast. Neukirchen Grund (sec. 4A-6) and Langballig Bank are the only detached dangers.

Langballig Bank, consisting of two patches, extends about 1 mile northwestward from a position about 2 $\frac{1}{2}$ miles westward of Borreshoved. The western patch has a least depth of 7.5 m (24.6 ft.); the eastern, 8.2 m (26.9 ft.). A buoy is moored, respectively, eastward and westward of the patches.

The German coast between Habernis and Bockholmwik, about .7 miles west-northwestward, is rather high, partly wooded, and fairly well built up. Off the village of Westerholz, about $4\frac{1}{4}$ miles west-northwestward of Habernis, and off Bockholmwik the coast is low. At Bockholm, about 1 mile north-northwestward of Bockholmwik, the land rises to an elevation of 111 feet.

Langballigau, a small fishing harbor sheltered by two moles, is located about $\frac{3}{4}$ mile northwestward of Westerholz. A berth alongside the eastern mole has depths of 2.8 m (9.1 ft.). A pair of lights in range 177° are shown in the harbor.

Conspicuous landmarks on this coast are the

church at Neukirchen, a windmill at Westerholz, and a white **beacon** with a cone topmark located near the coast about $\frac{1}{2}$ mile north-eastward of Westerholz.

Westerholz tileworks pier with a depth of 15 feet at its head is located on the point north-northwestward of Westerholz.

A **light** is shown at Neukirchen about $1\frac{1}{4}$ miles westward of Habernis.

The Danish coast between Borreshoved and Brunsnæs, about $4\frac{1}{4}$ miles west-northwestward, is less steep and not as wooded as the German coast. Skelde Vig, an **anchorage** for small vessels, lies about midway between the two points. It has depths of $3\frac{1}{2}$ to $7\frac{1}{2}$ fathoms and is sheltered from winds from west through north to east.

A **buoy** is moored a short distance off the steep-to shorebank extending southward from Borreshoved. **Buoys** are moored off the southwestern and western sides of the shorebank that extends $\frac{1}{2}$ mile southwestward through nearly 1 mile westward from Brunsnæs.

Holnis Light is shown on the west coast of Holnis about $1\frac{1}{2}$ miles north-northwestward of Bockholm and indicates the fairway in the eastern part of the inner fjord. A **beacon** with a white cone topmark stands on the east coast of Holnis nearly $\frac{3}{4}$ mile east-southeastward of Holnis Light.

A **light buoy** moored about $\frac{1}{2}$ mile offshore southeastward of the above-mentioned beacon lies on the west side of the fairway at the turning position of the channel in the inner fjord.

Holnis Light in range with the beacon east-southeastward of it indicates the Danish-German boundary of the eastern part of the outer fjord.

4A-13 Central part of the inner fjord.—The peninsula of Holnis extends about 2 miles

north-northeastward from the general vicinity of Bockholm and forms three reaches in the fjord which trend in a north-northeasterly, west-northwesterly, and southwesterly direction. The southwestern reach westward of Holnis is less than 1 mile wide in its narrowest part and the channel here is further restricted by shorebanks. Holnis is low in its southern part but rises to an elevation of 98 feet in its northern part.

A pier with a depth of 1.5 m (4.9 ft.) at its head extends from the shore nearly 1/2 mile southwestward from the northeast point of Holnis and another pier with a depth of 3.0 m (9.8 ft.) at its head projects from the latter point.

Except for Holnis Haken and Schidenkind, the 5-fathom curve trends rather regularly about 1/4 mile off the east side and about 1/2 mile off the north side of the peninsula. There is a least depth of 7.2 m (23.6 ft.) in the fairway indicated by the range lights in the three reaches around the peninsula.

Holnis Haken, a steep-to sand spit with drying rocks, extends nearly 1/2 mile northeastward from the northeast point of Holnis. A **light buoy** is moored off the outer end of this spit.

Schidenkind is the shorebank that extends northward and over 1/2 mile northwestward from the low marshy northwest point of Holnis. **Buoys** are moored on the northern and northwestern parts of this shoal area and a **light buoy** is moored in about 5 fathoms at the northwestern end of Schidenkind.

Holdnaes Middelgrunde, consisting of several patches with depths of 7.2 to 9.8 m (23.6 to 32.1 ft.), lie in the fairway close eastward of Holnis Haken.

On the Danish coast there are two shallow bights between Brunsnæs and Renbjerg, a village on the coast about 1 3/4 miles north-northwestward. The 5-fathom curve lies up to 3/4 mile offshore in these bights. A **buoy** is moored

on this 5-fathom curve a little over 3/4 mile north-northwestward of Brunsnæs.

A detached patch with a least depth of 20 1/2 feet lies about 1/2 mile south-southwestward of Renbjerg.

There are several tileworks piers in the bight northeastward of Brunsnæs. There is also a tileworks pier at Renbjerg.

Skodsbøl Range Lights in line 027 1/2° indicate the fairway through the north-northeastern reach through Holnis. The front light is shown about 1 1/2 miles northward of Brunsnæs. There is a least depth of 9.6 m (31.4 ft.) on this range, but it passes very close to the 7.2 m (23.6 ft.) patch of the southwestern shoal of Holdnaes Middelgrunde.

Rinkenaes Bugt, the approach to Egersund and Nybol Nor, is the coastal indentation between Renbjerg and Dalsgaard, a village located about 1 1/4 miles westward. The western part of the bay is shallow but there are depths of 4.5 to 9.9 m (14.7 to 32.4 ft.) in the eastern part of the bay. A 4.5 m (14.7 ft.) shoal lies in the outer part of the bay in a position about 1 mile northwestward of the northeast point of Holnis. A **buoy** is moored in about 5 fathoms on the south side of this shoal and also indicates the north side of the fairway in the west-northwestern reach of Holnis.

Egersund is described in section 4A-17.

Dalsgaard Grund is a steep-to shorebank that extends nearly 1/2 mile offshore from the coast close southward of Dalsgaard. Two **buoys** are moored less than 1/4 mile apart on the southeastern side of this shoal area.

Rinkenæs Range Lights in line 289° indicate the fairway in the west-northwestern reach of Holnis from the intersection of Skodsbøl Range off Holnis Haken to a position southward of Dalsgaard Grund. The front light is shown about 1/4 mile southward of Dalsgaard. There is a least depth of 9.7 m (31.8 ft.).

A pair of white triangular **beacons** in range about 261° are located near the shore about $\frac{3}{8}$ mile south-southwestward of Rinkenæs front range light and are aids in executing the turn toward the narrows of the southwest reach from the Rinkenæs Range. There is a least depth of 9.7 m (31.8 ft.) on this range.

Southwestern reach of Holnis.—This reach lies between Rinkenæs front range light and Brenstoft Hage, about 1 mile south-southwestward, on the Danish coast and the northwest point of Holnis and the point on which stands Holnis Light, also about 1 mile south-southwestward, on the German coast. The 5-fathom curve trends very irregularly off both shores, lying up to $\frac{1}{3}$ mile off the Danish shore and up to $\frac{3}{4}$ mile off the German shore. In addition there are several detached patches with depths of less than 5-fathoms between the shorebanks.

The fairway in this reach is marked by **buoys** of the Danish system on the northwest side of the channel and by buoys of the German system on the southeast side; the midchannel buoys are of the German system. The fairway is narrowest in its entrance between the buoy marking the southern side of Dalsgaard Grund and the light buoy marking the northwest end of Schidenkind.

Laagemade Range Lights in line 048° indicate the fairway in the southwest reach of Holnis from the entrance southward of Dalsgaard Grund to a position southward of Okseøer, in the western part of the inner fjord. The front light of this range is located nearly $\frac{1}{2}$ mile northwestward of Renbjerg. There is a charted depth of 7.2 m (23.6 ft.) on this range. Greater depths are found by passing eastward of the midchannel buoy moored about $\frac{1}{2}$ mile northwestward of the northwest point of Holnis.

The Danish-German boundary around Holnis is indicated by the four ranges described above.

4A-14 Western part of the inner fjord.—

This part of the fjord lies between Brenstoft Hage and the entrance of the port of Flensburg, about $4\frac{1}{2}$ miles southwestward. There are general depths of $5\frac{1}{2}$ to 11 fathoms between the shorebanks. Several detached patches, the shoalest having a depth of 20 feet, and several wrecks lie in this part of the fjord but are well clear of the fairway to Flensburg.

Okseøer are two islets that lie within $\frac{1}{2}$ mile of the Danish coast about 2 miles southwestward of Brenstoft Hage.

The German coast between Holnis Light and Farensort, about $4\frac{1}{4}$ miles southwestward, is low for the first $\frac{1}{2}$ mile and thence it is high and wooded. The 5-fathom curve lies up to $\frac{2}{3}$ mile offshore in the vicinity of Holnis Light but farther southward it lies within about $\frac{1}{4}$ mile offshore.

Three **buoys** are moored at the outer end of a mussel bed, about 2 miles long, in the vicinity of Holnis Light.

A white **beacon** stands on the coast close southwestward of Holnis Light. Schausende Brickworks is situated about $\frac{1}{2}$ mile south-southwestward of Holnis Light and a lookout tower stands conspicuously at Sandwig about $1\frac{3}{4}$ miles southwestward of the same light. A summer resort is located close southward of the tower. Here there is a pier with a depth of 10 feet at its head. Another pier with a depth of 9 feet at its head lies in the small bay southwestward of the resort. There is also a small pier at Solitude about $\frac{3}{4}$ mile eastward of Farensort. Anchoring and fishing are prohibited in a degaussing range area, about 400 yards square, marked by buoys, beacons and lights, located about $\frac{3}{4}$ mile northeastward of the pier at Solitude. A foul patch lies about $\frac{2}{3}$ mile north-northeastward of the head of the pier at Solitude.

A foul patch lies about $\frac{2}{3}$ mile north-northeastward of the head of the pier at Solitude.

The Danish coast between Brenstoft Hage and the head of Kobbermølle Bugt (Kupfer-

mühlen Bucht), nearly $5\frac{1}{2}$ miles southwestward, is fairly high and steep. The head of the latter bay is wooded and there are woods around Sønderhav, westward of Okseøer. The 5-fathom curve lies up to $\frac{3}{8}$ mile offshore and rounds Okseøer at a distance of about $\frac{1}{4}$ mile. A detached patch with a least depth of 20 feet lies about $\frac{1}{2}$ mile north-northeastward of Okseøer.

A wreck with a depth of $6\frac{1}{2}$ fathoms lies about $\frac{3}{8}$ mile southward of the western islet of Okseøer. Several wrecks with a least depth of 8.2 m (26.9 ft.) are sometimes charted in an area about $\frac{3}{4}$ mile north-northeastward of Farensort.

A spoil ground with buoys moored at its four corners is located about $\frac{2}{3}$ mile west-northwestward of Farensort.

There is a channel with a least depth of $3\frac{1}{4}$ fathoms between Okseøer and Sønderhav. A submarine cable marked by a pair of range beacons on the mainland is laid between Okseøer and Sønderhav in the southern entrance to the channel.

A white beacon stands on the eastern islet of Okseøer. Another white beacon stands on Kohage, a narrow tongue of land located about $\frac{3}{4}$ mile southward of Okseøer.

A conspicuous lookout tower stands about $\frac{3}{8}$ mile northward of Kohage.

At the summer resort of Kollund, located about $1\frac{1}{2}$ miles southwestward of Kohage, there is a pier with a depth of 3.5 m (11.4 ft.). Northeasterly winds may raise the water level as much as 5 feet and southwesterly winds may lower it the same amount.

Boundary beacons.—The Danish-German frontier is at the head of Kobbermølle Bugt. The water boundary is further indicated as follows: the continuance of the Laagemade Range to the intersection of a range formed by Holnis Light in line with the white beacon located close southwestward. The remaining five legs of the boundary are defined by four

pairs of white range beacons standing near the shore between the resort of Kollund and the western side of Kobbermølle Bugt and also by the range formed by the white beacons on Kohage and Okseøer.

Anchorage.—With easterly and northeasterly winds there is good anchorage for small vessels off the western side of Holnis as far southward as Schausende Brickworks. Fresh southwesterly winds raise a considerable sea in this part of the fjord. During such times small vessels can anchor in the bay northward of Okseøer.

Directions for the inner fjord.—Deep-draft vessels proceeding to Flensburg are advised to employ a pilot for the following reasons: (1) the fairway is very narrow and the turns are sharp, which often requires the use of a tug; (2) gales, especially those from the west to northwest, may lower the water level as much as $6\frac{1}{2}$ feet to $8\frac{1}{4}$ feet; (3) with the latter winds the current is very strong.

From a position about $\frac{3}{4}$ mile southward of Borreshoved (sec. 4A-9), vessels should steer for Holnis Light on a course of 292° until the Skodsbøl Range ($027\frac{1}{2}^\circ$) is intersected in the vicinity of the light buoy northeastward of Bockholm. This course passes well northward of Langballig Bank. Thence vessels should steer in on the Skodsbøl Range until the Rinkenæs Range (289°) is intersected in a position close northeastward of the light buoy marking Holnis Haken. This course leads between the projecting shorebank off Brunsnæs and Holdnæs Middelgrunde, on the east, and Holnis Haken, on the west, but it passes very close to the 7.2 m (23.6 ft.) patch on Holdnaes Middelgrunde; care must be taken to avoid this shoal.

When the Rinkenæs Range is in line 289° , vessels should steer for it until Holnis Light opens westward of the northwest point of Holnis. At this time vessels should begin to turn gradually westward and southwestward to pass between the buoy marking the southern end of

Dalsgaard Grund and the light buoy off the northwest end of Schidenkind. Laagemade Range will now be seen astern in line 048°.

With Laagemade Range in line 048° astern, vessels should steer 228° between the buoys marking the sides of the narrow fairway and continue on this course until southward of Okseøer, wherefrom vessels should steer for a position about 1/4 mile northwestward of Farensort.

Greater depths than those found on the Laagemade Range lie to the eastward of the northern of the two midchannel buoys in the narrows.

FLensburg AND APPROACHES

Position: 54°48'N., 9°26'E.
 Depths: Roadstead, 9.4 to 20.8 m (5.1 to 11.3 fm).
 Murwick, 6.4 to 7.9 m (20.9 to 25.9 ft.).
 Harbor, 5.5 to 11.0 m (3.0 to 6.0 fm).
 Berths, 4.0 to 8.5 m (13.1 to 27.8 ft.).
 Tidal range: Negligible.
 Port plan: See section 4A-16.

4A-15 The port of Flensburg comprises the narrow inlet that is the head of Flensburg Fjord. The terminal facilities lie on both sides of this natural basin and also in an artificial basin on the east side of the harbor entrance. The city is concentrated on the west and south sides of this basin.

The naval establishment of Mürwik with its berthing facilities lies on the eastern shore of the port approach.

The port approach is about 1 1/2 miles wide at Farensort, but the entrance channel is restricted to a width of less than 1/4 mile by the shoals of Mittelgrund and Osbekgrund. The roadstead lies between Farensort and Mittelgrund.

Water level.—Southern winds lower the water level; northeasterly winds raise the water level. The highest observed level is 10 feet above mean sea level; the lowest, 8 feet below. The expected extremes are 5 1/2 feet above and 5 feet below.

Ice.—The harbor freezes only during severe winters. For more details, see section 4A-8.

Approach and landmarks.—The port approach lies westward of Farensort and has shoals in its central and western part. The roadstead lies northeastward of Mittelgrund and has depths of 9.4 to 20.8 m (5.1 to 11.3 fm). The entrance channel lies between these shoals and the eastern shorebank and has depths of 8.1 to 17.6 m (4.4 to 9.6 fm).

Mittelgrund, the northernmost shoal in the approach, lies about 3/4 mile westward of Farensort and has a least depth of 4.5 m (14.7 ft.). A buoy is moored in a depth of less than 10.0 m (5.4 fm) about 1/4 mile eastward of the northern end of the shoal and marks the western side of the entrance channel. Osbekgrund, the southeastern shoal, lies close southward of Mittelgrund and has a least depth of 5.0 m (16.4 ft.). A buoy is moored in a depth of about 7.6 m (24.9 ft.) close eastward of this shoal. Westward of these two shoals there are several detached shoal patches.

Farensort has white sand on it. The tower of the naval academy on the high ground at Mürwik and several churches with tall steeples at Flensburg are prominent landmarks. A conspicuous water tower stands a short distance southward of the naval academy. Kielseng, a cliff covered with bushes and rising to an elevation of 124 feet a short distance inland, lies on the eastern side of the harbor entrance.

A pair of lights in range 197° are shown on Kielseng and indicate the fairway in the entrance channel. There is a least depth of about 8.1 m (26.5 ft.) on this range. Another pair of lights in range 229° are shown near the power station on the west side of the harbor entrance and lead southeastward of Osbekgrund to the harbor.

Mürwik, a naval facility closed to commercial shipping, has a small harbor formed by a concrete offshore wharf, on the north, and a pier extending offshore, on the south. The face of the offshore wharf has a berthing length of about 800 feet and a depth of 26 feet. The pier is about 450 feet long and has depths of 21 feet on both sides. The inner part of the basin has accommodations for small vessels.

Lights are shown on the south end of the offshore wharf and on a dolphin off the outer end of the pier.

Harbor.—The harbor comprises a natural basin about $1\frac{1}{4}$ miles in length and an artificial basin, at Freihafen, on the east side of the harbor entrance. The greater part of the natural basin is lined with quays having depths of 4.0 to 8.5 m (13.1 to 27.8 ft.). The artificial basin is about 1,500 feet long and about 230 feet wide. Only the east side of this basin, where there are depths of 7.6 m (24.9 ft.), is suitable for berthing.

Depths in the harbor vary from 3 to 6 fathoms outside the narrow shorebanks. A detached 5.3 m (17.3 ft.) patch lies close off the western side of the middle of the harbor. Two floating drydocks are moored close westward of the patch.

There is a least depth of 8.1 m (26.5 ft.) on the harbor ranges as far as the floating drydocks; farther southward there are lesser depths. Under favorable conditions, vessels with a draft of $22\frac{1}{2}$ feet can enter the port. In 1951 a vessel with a draft of 23 feet docked at the quay at the power station.

A large shipyard that builds drydocks and ships is located on the western side of the harbor entrance. Close southward are the power station and gasworks.

A **submarine power cable**, gas lines, and water lines cross the harbor between the gasworks and Freihafen. **Notice boards** on each shore indicate the position of the power cable.

A pair of **lights** in range 201° are located on the west side of the inner harbor and indicate the fairway from the entrance to the middle of the harbor.

There are several **mooring buoys** and a number of **dolphins** in various places in the harbor.

A ferry crosses the harbor at the inner end of the basin.

Pilots are available at the harbor.

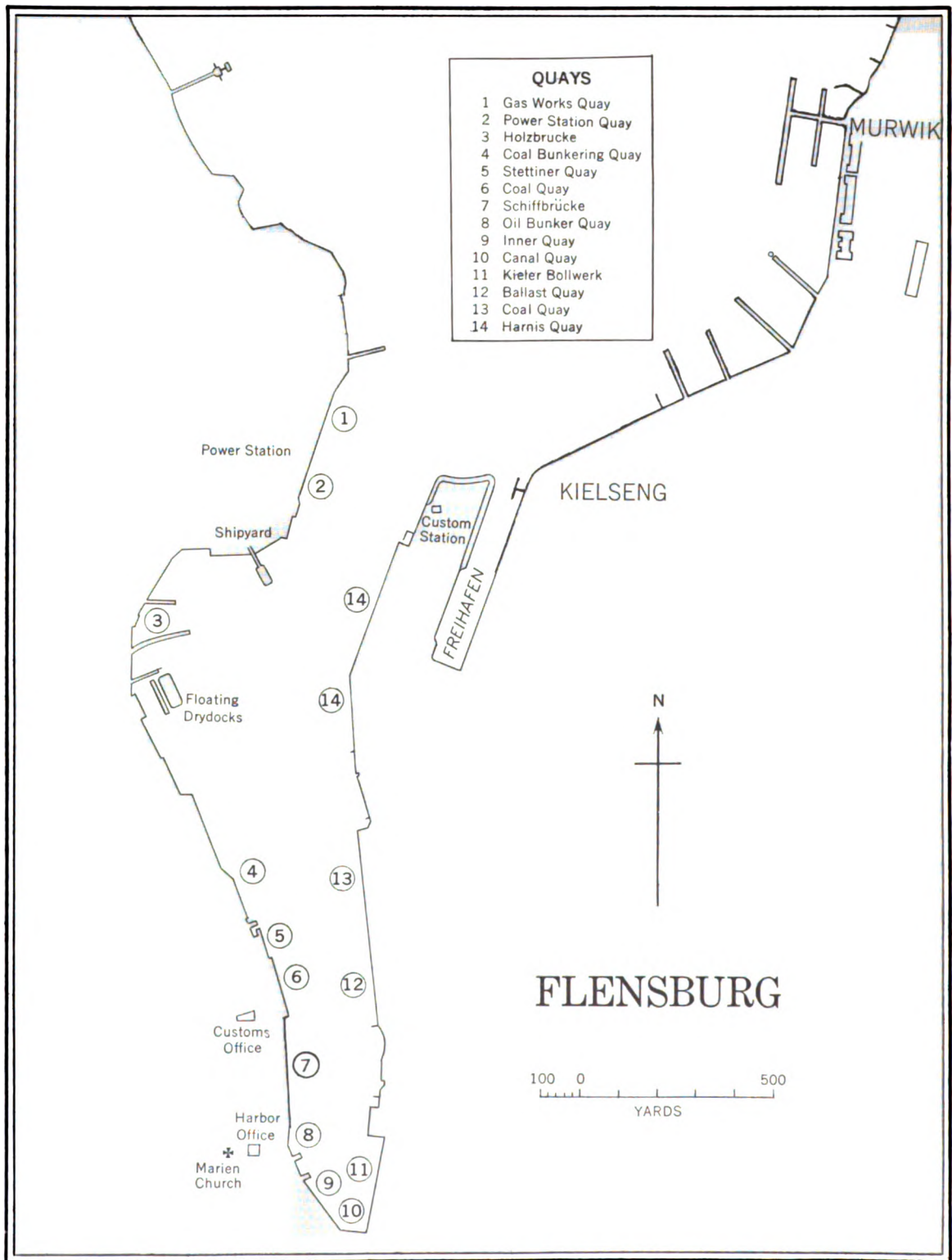
Anchorage.—The harbor is too narrow for anchoring vessels of average size. Vessels generally anchor in the roadstead northeastward of Mittelgrund in 12.0 to 19.0 m (6.5 to 10.3 fm), mud. A dumping ground northward of Mittelgrund is also the quarantine anchorage area.

Directions.—Vessels entering Flensburg harbor should steer 205° for Marien Church, on the western side of the harbor near the head of the basin, until the tower of the naval academy is abeam, whence course should be altered to 197° until abeam the wharf at Murwick. The above courses lead eastward of Mittelgrund and Osbekgrund in a least depth of 11.1 m (6.0 fm). At night, vessels should approach the harbor with Kielseng Lights in range 197° ; this course leads over a least depth of about 8.1 m (26.5 ft.).

When abreast the offshore wharf at Murwik and when the lights at the power station are in range 229° , vessels should steer in on this range until the range (201°) in the southern part of the harbor is intersected. At this time, vessels should steer in on this latter range to the middle of the harbor.

4A-16 FACILITIES.—Flensburg, with a population of 96,000 (1966), is a long-established commercial port and rail center near the Danish border. Coal is the principal item of commerce. Export commodities are coke, iron ware, lime, brick and paper; import commodities, cattle, fish, grain, wood, kaolin and stone. Shipbuilding and fish processing are prominent industries. At Freihafen, which consists of the artificial basin and Harnis Quay, there is a customhouse. The harbor office and another custom office are located near the waterfront on the west side of the inner harbor.

Berths.—The principal berths are as follows: The Power Station Quay fronts the power station and has a berthing length of about 435 feet with a depth of 7.0 m (22.9 ft.). Harnis Quay, in Freihafen facing the main harbor, has a berthing length of about 1,600 feet and a depth of 6.5 m (21.3 ft.). The Coal Bunkering Quay, on the west side of the middle harbor, has a berthing length of about 590 feet with a depth of 20 feet.



There are other quays in the harbor that have depths of 3.9 to 6.4 m (12.7 to 20.9 ft.); some have sufficient length to berth an average-size vessel.

The basin at Freihafen is unfinished and has berthing facilities only on the east side.

Most of the berths are served by the railroad. There are cranes with lifting capacities of 5 to 100 tons. Several small lighters and one tug are available.

Supplies.—Ship supplies, provisions, water, and coal are procurable. A small stock of diesel oil is maintained.

Repairs.—There are two shipyards that can undertake ship repairs, and a floating drydock with a lifting capacity of 1,500 tons. A diver is available.

Communication.—The city is served by the general railroad system which connects with that of Denmark. It is also connected to the general telephone and telegraph system. There is regular steamer traffic with local ports. There is an airport in the city.

Medical.—There are several hospitals in the city.

Deratting.—See section 1-7.

EGERNSUND AND NYBØL NOR

4A-17 Egersund, a short and narrow strait, leads between two peninsulas and provides access to the small port of Graasten and Nybøl Nor from Flensborg Fjord. It is approached through Rinkenæs Bugt. The village of Egersund with its waterfront facilities lies on the east side of the passage. Graasten lies at the head of the small bay northwestward of Egersund. Nybøl Nor, an enclosed body of water, lies northward of Egersund and has depths varying up to 5½ fathoms.

There are depths of 3½ to 5½ fathoms in the approach in Rinkenæs Bugt. In the narrow fairway in Egersund there is a least depth of 8.6 m (28.2 ft.) westward of the village and a least depth of 23 feet northward of the village. The channel leading into Graasten has a least depth of 16 1/2 feet.

Rinkenæs Bugt is described in section 4A-13 except for the entrance to Egersund. The entrance of the passage lies between two steep-

shorebanks that extend southward from the peninsulas on either side of Egersund. **Buoys** are moored on the outer edge of these shorebanks to indicate the fairway. A pair of **lights** in range 335½° are located on the western peninsula and indicate the approach to and the fairway in the entrance of the passage.

There is good **anchorage** in the eastern part of Rinkenæs Bugt in 3¾ to 5½ fathoms, mud and ooze.

Egersund.—The middle of the passage is considered to be the harbor of Egersund. At the village there are a number of small loading piers with depths of 3.6 to 4.7 m (11.8 to 15.4 ft.) alongside.

Submarine cables cross the passage near the ferry slips. A pair of **beacons** on the western shore indicate the position of the high tension cable.

A drawbridge with lighted bridge piers crosses the passage.

The mean tidal range at Egersund is about 4 feet. Northeast winds may raise the water level up to 8¼ feet and southwest winds may lower it the same amount.

A pilot is available from Graasten. Water and provisions are procurable. The village has a machine shop and a small marine railway. Diver assistance is available. The village also has custom service.

Two pairs of **range lights** indicate the fairway to the swinging basin adjacent to the quay. The outer range is in line 334° and the inner range is in line 345°.

The swinging basin has a depth of 16½ feet and the quay has a berthing length of about 500 feet and a depth of 16½ feet alongside. A short pier projects from the western end of the quay and has a depth of 16½ feet alongside.

Easterly gales may raise the water level about $2\frac{1}{4}$ feet and westerly gales may lower it the same amount.

A **pilot** is available at the harbor, and there is custom service. Water, provisions, and tug service are available. The quay is served by the railroad.

Nybol Nor has its deepest water, about 5.9 to 9.9 m (19.3 to 32.4 ft.), in a pool situated in the western part of this water. The channel from Egersund leads to this pool; it is quite narrow but deep and is marked with buoys. The village of Nybol lies on the eastern shore. The coastal bank, extending about $\frac{3}{8}$ mile from the southern shore, is marked with a buoy at its outer end.

ANCHORAGES

4A-18 Geltinger Bucht.—See section 4A-9.

Sønderborg Bugt.—See section 4A-11.

Skelde Vig.—See section 4A-12.

West of Holnis.—See section 4A-14.

Flensburg.—See section 4A-15.

Part B. FLENSBORG FJORD TO KIELER FÖRDE

4B-1 Schleimünde ($54^{\circ}40' N.$, $10^{\circ}02' E.$) is the entrance to the Schlei. It is described in section 4A-1.

GENERAL REMARKS

4B-2 This part describes the Schlei, Eckernförder Bucht, and the intermediate coasts as far as Kieler Förde. It encompasses the German coast between Schleimünde and Bülk, about $14\frac{1}{4}$ miles south-southeastward.

The Schlei, a river-type arm of the sea, is entered at Schleimünde and recedes inland about 22 miles. This inlet trends very irregularly and varies in width from about 100 yards to

over 2 miles. Alluvial deposits caused by currents reduce the depths in the fairway from time to time; therefore the channel must be maintained by dredging.

There are two small ports on this waterway. Kappeln lies about 4 miles inside the entrance and Schleswig lies at the head of the inlet. Two swing bridges, with a horizontal clearance of 73 feet, span the Schlei, one at Kappeln and the other at Lindaunis, nearly 7 miles farther inside.

Between the Schlei and Eckernförder Bucht, about $7\frac{1}{4}$ miles southward, the coast is low for about 2 miles, then becomes steep, and farther southward is wooded. A lake with a narrow outlet to the sea lies about midway along this coast.

Eckernförder Bucht is a spacious and fairly deep inlet. It is about $5\frac{1}{4}$ miles wide in its entrance and gradually narrows to a width of about $1\frac{1}{2}$ miles at its head. With the exception of Mittelgrund (sec. 4B-3), the bay is danger free and affords good depths for anchorage. The small port of Eckernförde lies at the head of the bay.

The coast between Eckernförder Bucht and Kieler Förde is fronted by two large shoal banks between which there is a navigable channel.

A foul ground and a prohibited area lie about 2 miles offshore between Schleimünde and Eckernförder Bucht (see section 4A-1).

Fisheries.—Extensive mackerel and herring fishing is carried out with drift nets in the northern part of Eckernförder Bucht and the inner part of the bay.

DEPTHS

4B-3 Off Schleimünde the 5-fathom curve lies almost 2 miles offshore.

The Schlei is mostly shallow, though several pools have depths as great as 14.4 m (7.8 fm). Portions of the fairway between the river entrance and Schleswig are improved by dredging; the least depth in the fairway between the river entrance and Arnis is 3.7 m (12.1 ft.) and between Arnis and Schleswig, 3.3 m (10.8 ft.).

Between Schleimunde and Eckernförder Bucht the 5-fathom curve lies between about 1 and 1/2 mile offshore. Wrecks, with swept depths of 17.0 and 20.0 m (9.3 and 10.9 m) over them, lie about 3 miles and 4 miles, respectively, southeastward of Schleimunde.

Eckernförder Bucht has general depths of about 5 to 15 fathoms. The shorebank as defined by the 5-fathom curve lies between about 3/4 and 1/4 mile off the north and south shores and about 1/4 mile from the head of the bay.

Mittelgrund, a shoal area with a least charted depth of 7.8 m (4.2 fm), lies in the middle of the entrance of the latter bay. It is steep-to on its northern, southern, and western sides. A detached patch of foul ground lies about 1/2 mile eastward of the eastern extremity of Mittelgrund. Buoys are moored off the eastern, western, and southern sides of Mittelgrund.

Between Eckernförder Bucht and Kieler Förde, the shorebank as defined by the 5-fathom curve lies up to 1 3/4 miles offshore.

Stollergrund, a large foul area with submerged stones, lies detached up to about 4 1/4 miles off the above-mentioned coast. There is a least charted depth of 5.0 m (2.7 fm) on this shoal; in places rocks stand up 3 feet from the bottom. Buoys are moored off the western and northern sides of Stollergrund.

Stollergrund Rinne (sec. 4B-10) has a least depth of 11.0 m (36.0 ft.).

WATER LEVEL

4B-4 At Schleimunde, continuous northeast to east-northeast gales may raise the water level as much as 10 1/2 feet above the mean level and west-southwest gales may lower it as much as 6 feet below the mean level.

At the harbor of Eckernförde, northeast

winds may raise the water level as much as 3 feet and southwest winds may lower it as much as 4 feet.

ICE

4B-5 In this area, ice tends to form sooner in the inlets than along the coast. More details are given with descriptions of the individual features and in table 6 in chapter 1.

THE SCHLEI

4B-6 A general description of this waterway is given in section 4B-2.

CURRENTS.—The current usually sets in the direction of the channel and may attain a rate of 3 knots. The incoming current is stronger with northeasterly winds and the outgoing current is stronger with southwesterly winds. The tides are negligible.

ICE.—Except during severe frosts the Schlei freezes over sooner than the outer waters. During severe winters, both ports on this waterway are icebound.

It is very seldom that this waterway is entirely free of ice. From 1920 to 1949, ice has been observed to remain as little as 1 day and as long as 110 days in one year. The dates of formation and disappearance of ice are given in table 6 in chapter 1.

Generally the channel between the entrance and Lindaunis is kept open by steamer traffic and the strong currents. However, during severe winters an ice barrier forms across the entrance and prevents entry or departure of vessels, even though the ice sheet inside or outside can be broken through.

PILOTAGE is not compulsory but it is advisable. Pilots are stationed at Schleimunde and will take vessels to Schleswig or any intermediate place. They board vessels outside the entrance channel. Should the weather be too rough for them to board vessels, the pilot flag will be hoisted and dipped twice at the signal mast at the pilot station.

TOWAGE.—The steamer that runs between Kiel and Kappeln will tow vessels to and from Kappeln. Other steamers on the Schlei will

act as tugs to vessels proceeding to places farther up the waterway.

The **entrance** is described in section 4A-1. The channel from the sea to the Schlei is dredged to a depth of about 5.0 m (16.4 ft.) and is marked by buoys with radar reflectors. The depths in the channel vary from time to time. A tide gage stands about 100 yards northward of the northern breakwater.

With westerly winds there is good anchorage in 10.0 to 15.0 m (5.4 to 8.2 fm) about 2 miles seaward of the entrance; this anchorage is unsafe with strong easterly winds.

Schleimünde to Kappeln.—The Schlei inside the entrance opens into a small expanse of water that is surrounded by low shores. The small village of Massholm lies on the north side of this water about $1\frac{3}{4}$ miles inside the entrance. A branch channel marked with **buoys** leads from the main channel to a jetty at this village.

The channel from Schleimünde to Kappeln consists of four reaches and is marked with **buoys**. Just within the entrance and on the north side of the channel there are several **dolphins**. Because the buoys are often rammed by vessels or are carried away, mariners are advised to exercise caution when navigating here.

Four pairs of **range lights** indicate the channel from the entrance to Kappeln, one for each reach in the channel. The first reach is indicated by a pair of lights in range $107\frac{1}{2}^\circ$ (seen over the stern) located near the root of the north breakwater. The other three pairs of lights are located nearly 3 miles westward of the entrance where the waterway narrows. In the respective order of the reaches from east to west, these lights are in range $273\frac{1}{2}^\circ$, 266° , and 213° .

Directions for Kappeln.—Vessels bound for Kappeln should have local knowledge.

Vessels should approach Schleimünde with Schleimünde Light in range about 286° with

the southern edge of Buckhagen Wood, located about $2\frac{3}{4}$ miles west-northwestward, and continue on this range until the outer buoys are sighted. Thence vessels should be guided by the buoys and ranges that indicate the fairway.

4B-7 Kappeln, a town with a population of about 4,500 (1965), lies on the west side of the waterway. Fishing, food processing, and metal and wood works are the main industries. Excursion steamers call here. Water is available. There is a small stock of fuel oil. Small repairs can be effected. The town has railroad connections with Schleswig, Eckernförde, and Flensburg.

The waterfront is quayed northward and southward of the bridge. On the north side of the bridge there is about 850 feet of berthage with depths of about 4.0 m (13.1 ft.); the longest berth is 575 feet. On the south side of the bridge there is about 1,000 feet of berthage with depths of 1.0 to 3.0 m (3.2 to 9.8 ft.). There is also a dolphin berth with a depth of 4.0 m (13.1 ft.) alongside.

A highway swing bridge, with a horizontal clearance of 73 feet, crosses the Schlei at Kappeln. The bridge is generally open during daylight hours. Vessels desiring to pass through at other times must give notice to the Waterways Office at Kiel at least 24 hours previously. Traffic regulations are in effect, and the bridge is marked with lights.

Submarine cables cross the Schlei close northward and southward of the bridge. **Warning boards** ashore indicate the position of the cables.

Kappeln to Schleswig.—The village of Arnis lies on the west side of the Schlei about $1\frac{3}{4}$ miles southward of Kappeln. The village has a short quay with a depth of 5 feet alongside and also a jetty for the regular steamers in the Schlei. A cable ferry crosses the waterway at Arnis.

Submarine cables cross the Schlei at Arnis, and about $\frac{1}{2}$ mile southwestward of the village. Warning boards indicate the positions of the cables.

In the narrows close southward of Arnis there is a depth of 12 feet in the middle of the fairway. It is recommended that vessels with a draft greater than 9 3/4 feet favor the south side of the fairway.

The village of Lindaunis lies on the north side of the Schlei about 4 miles southwestward of Arnis. A highway and railroad bridge, with a bascule span having a horizontal clearance of 73 feet, crosses the Schlei at Lindaunis. The bridge is generally open from 0530 to 1 hour after sunset. Vessels desiring to pass through at other times must give notice to the Waterways Office at Kiel at least 48 hours in advance. Traffic regulations are in effect.

An overhead cable spans the Schlei about 3/4 mile northeastward of the bascule bridge at Lindaunis. Vessels with a mast height not exceeding 85 feet can, when in the fairway, pass under the cable.

SCHLESWIG, the capital of the province of Schleswig, has a population of about 33,000 (1965). It lies at the head of the Schlei and has an airport and small harbor. The city is engaged in the manufacture of cordage, leather goods, chemicals, and furniture, and in food processing. It has railroad connection with the general system.

In the harbor, on the south side of the city, and in the approach channel, there is a depth of 3.3 m (10.8 ft.). The quay in the harbor is about 800 feet long and has depths of 2.2 to 4.0 m (7.2 to 13.1 ft.).

Water is available. Small repairs to machinery can be effected. There is regular steamer connection with Kappeln.

THE SCHLEI TO ECKERNFORDER BUCHT

4B-8 From Schleimunde the coast trends southward from 7 1/4 miles to Boknis Eck, the northern entrance point of Eckernforder Bucht. Brodersby Mill, which stands on the high ground about 2 3/4 miles southwestward of Schleimunde, and Schönhagen Castle, about 2 1/2 miles southward of Schleimunde, are prominent.

The shorebank off this coast is foul within the 2-fathom curve and has a varicolored bottom of sand with small stones within the 5-fathom curve. Two detached rocks, with swept depths of 4.6 and 5.0 m (15.0 and 16.4 ft.), lie within 1 mile of the shore and about 3 miles southward of Schleimunde.

A prohibited area, 1 1/2 miles wide and 3 miles long, the limits marked by lighted and unlighted buoys, lies about 2 miles south-eastward of Schleimunde.

A rectangular foul area and former ammunition dumping ground is centered about 4 miles south-southeastward of Schleimunde.

Two pairs of beacons of a former measured distance stand on the coast about 1 mile northward of Boknis Eck.

Fishing stakes are placed along this coast in depths of 2 to 2 3/4 fathoms from April through July.

ECKERNFORDER BUCHT

4B-9 Eckernforder Bucht is entered between Boknis Eck and Danisch Nienhof, a poorly defined point about 5 1/4 miles south-eastward. The shores of the bay are high in places and are thickly wooded, especially on the southern side. Rounded hills up to 167 feet in height lie behind the shores. Several lakes are located near the coast.

SUBMARINE EXERCISE AREA.—A submarine exercise area, about 4 square miles in extent, lies centered about 6 1/2 miles northwestward of Kiel Light (sec. 4C-2) across the entrance to Eckernforder Bucht.

Mittelgrund (sec. 4B-3), the only danger, lies in the entrance to the bay. The shorebanks on both sides are fairly steep-to.

The port of Eckernförde lies on the north side of the head of the bay.

ICE.—The bay freezes over sooner than Kieler Förde because the ice is seldom broken by steamer traffic. Offshore winds drive out the ice. See table 6 in chapter 1 for dates of formation and disappearance of ice.

LANDMARKS.—On the north side of the bay there is an 88-foot chimney of a farm that stands out prominently at Klein Waabs, about 1 3/4 miles southwestward of Boknis Eck.

On the south side of the bay the following are prominent: Krusendorf Church, located about 3 miles west-southwestward of Danisch Nienhof; and Lindhoft Mill, located on a 126-foot hill about 2 3/4 miles westward of Krusendorf Church.

At the head of the bay the church in the town of Eckernförde is conspicuous.

NAVIGATIONAL AIDS.—A light is shown at the head of the bay. The tower of a hostel located about 1/4 mile west-northwestward of the light is conspicuous and from a distance may be easily mistaken for the lighthouse.

A buoy is moored less than $\frac{1}{2}$ mile offshore in a position nearly 3 miles south-southwestward of Boknis Eck. This buoy should be given a good berth as it is moored near the steep-to shorebank.

On the south side of the bay there is a buoy moored in less than 5 fathoms in a position about 1 mile west-northwestward of Dänisch Nienhof; it marks a wreck. Off the wrecked harbor at Surendorf, about $2\frac{1}{4}$ miles westward of Dänisch Nienhof, a buoy with a reflector marks an obstruction about $\frac{3}{8}$ mile offshore. A L-shaped mole extends about 400 yards northward from the shore at Surendorf.

At the head of the bay, a buoy is moored in about 11 fathoms in a position about 1 mile southeastward of Eckernförde.

A light buoy and a bell buoy, close westward, are moored southward of the destroyed harbor works at Der Ort; the latter is located about $\frac{3}{4}$ mile eastward of Eckernförde.

Lights are shown and a fog signal is sounded in the harbor of Eckernförde.

Measured distance.—A measured distance of 2 miles is located immediately southwestward of Boknis Eck. The distance is divided into two units, each 1 mile long, on a running line of 052° — 232° which is marked by a range. Three pairs of white **range beacons** ashore and three **buoys** offshore in line with the beacons indicate the running course of the measured distance. The northeastern pair of beacons is on Boknis Eck. The topmarks of the middle and southwestern pair of beacons have each a red border.

Torpedo Range.—A torpedo range, about $\frac{1}{2}$ mile wide centered on a bearing of $071^{\circ}30'$ for about $7\frac{1}{2}$ miles from Eckenforde Light, is located in the southern half of Eckernförder Bucht. The range is marked by lighted and unlighted buoys. A prohibited area is located in the **inner section**, about $\frac{1}{3}$ mile long, adjacent to the quay.

Eckernförde.—The harbor of this port consists of an outer and inner basin lying in the inlet between the town of Eckernförde and Borby. A wooden bridge, with a bascule span having a horizontal clearance of 27 feet, separates the basins. A short mole with a dolphin at the outer end projects from the southeast side of the outer basin. Storm signals are displayed in the harbor.

There are depths of 4.0 to 5.0 m (13.1 to 16.4 ft.) alongside the quays in the outer basin and 3.5 to 4.0 m (11.4 to 13.1 ft.) alongside the quays in the inner basin. Northeast winds may raise the water level as much as 3 feet and southwest winds may lower it about 4 feet.

Two buoys are moored on the edge of the shorebank on the north side of the outer basin. A buoy used for compass adjusting is moored in about 5 fathoms on the eastern side of the harbor entrance.

A small military harbor, closed to general navigation, is located about 1 mile eastward of Eckernförde.

There is good anchorage in 18.0 to 20.0 m (9.8 to 10.9 fm), mud and clay, in the roadstead in a position with Eckernförde Church bearing between 282° and 304° , distant about $\frac{3}{4}$ to 1 mile.

Facilities.—Eckernförde is a fishing port and popular seaside resort with a population of about 22,000 (1965). Principal industries are fishing, building materials, grain and fertilizer.

The southern side of the outer harbor has 1,300 feet of quayage with 4.0 to 5.0 m (13.1 to 16.4 ft.) alongside. Fishing vessels are accommodated. Fresh water and bunkers are available. The northern side of the inner harbor has 460 feet of quayage with 3.5 to 4.0 m (11.4 to 13.1 ft.) alongside; 270 feet of the quayage is available for cargo handling. The southern side of the inner harbor has 720 feet of quayage with 3.5 to 4.0 m (11.4 to 13.1 ft.) alongside; arrangements for the loading and discharge of grain are available.

The city is connected to the general railroad system. Water can be obtained and small repairs can be effected. There are no tugs.

Directions for Eckernförder Bucht and Eckenförde.—Vessels should approach the bay by passing northward of Stollergrund and Mittelgrund. To do this, vessels should steer about 259° for Klein Waabs Church, or the farm chimney near it, until a position about $3\frac{3}{4}$ miles eastward of Boknis Eck is reached. At this position Bülk Light (sec. 4C-1) will bear 159° . Thence vessels should steer 240° for Eckernförde Light, which leads to the roadstead off the harbor of Eckernförde.

To enter the harbor from the roadstead, vessels should steer about 307° for Borby Church, or about 310° for the western harbor light, until Eckernförde Light bears 180° .

Vessels may enter the bay by approaching through Stollergrund Rinne (sec. 4B-10). Vessels having passed northeastward of Bülk Light should steer for the eastern entrance of the channel and pass through it between the buoys on either side. When Eckernförde Light bears 252°, vessels either steer through the torpedo range on a course of 252° or, preferably, northward of the range until the roadstead at the head of the bay is reached.

ECKERNFÖRDER BUCHT TO KIELER FÖRDE

4B-10 The coast between Dänisch Nienhof and Bülk, nearly 3 miles southeastward, and the shoal areas that front this coast up to about 5 miles comprise the northwest approach to Kieler Förde. Stollergrund and the shorebank extending from this coast are described in section 4B-3.

Stollergrund Rinne lies between the 5-fathom curves that define the above two banks. This channel is marked by buoys.

A submarine cable is laid from Stollergrund Rinne generally northeastward to the southern part of Langeland (sec. 3D-10).

ANCHORAGES

4B-11 Off Schleimünde.—See section 4B-6.

Eckernförde.—See section 4B-9.

PART C. KIELER FÖRDE

4C-1 Bülk ($54^{\circ}27' N.$, $10^{\circ}12' E.$), the western entrance point of Kieler Förde, is a low rounded point that projects a little from the coast. A light is shown and a fog signal is sounded on Bülk. Storm signals are shown here by day and at night.

Kleverberg, a shorebank with depths of less than $19\frac{1}{2}$ feet and consisting of sand and stones, fronts the point to a distance of about $\frac{3}{4}$ mile. The 5-fathom curve lies nearly $1\frac{1}{2}$ miles eastward of the point; a lighted whistle

buoy with a radar reflector is moored close seaward of this curve. A buoy is moored on Kleverberg nearly $\frac{1}{2}$ mile east-northeastward of Bülk. Another buoy is moored in about 5 fathoms on the southern side of Kleverberg in a position about $\frac{3}{4}$ mile south-southeastward of Bülk.

The eastern entrance point of Kieler Förde is located about $4\frac{1}{2}$ miles east-southeastward of Bülk and is poorly defined. The coast here is low and protected by dikes. The only notable feature in this vicinity is the village of Stein, located about $2\frac{1}{4}$ miles southwestward of the eastern entrance point. The 5-fathom curve lies about $1\frac{1}{2}$ miles offshore.

GENERAL REMARKS

4C-2 Kieler Förde extends about 9 miles in a south-southwesterly direction from Bülk and forms one of the best natural harbors in the Baltic Sea. The fjord inside the entrance becomes rather narrow, being less than $1\frac{1}{2}$ miles wide in the inner part. The depths are ample to accommodate any vessel that is able to negotiate the waters of the western Baltic Sea.

The fjord is nearly enclosed by wooded hills, from about 50 to 180 feet in height, and the shores are fringed with sandbanks. The hinterland in the outer part of the fjord is rather extensively cultivated. The inner part of the fjord is heavily populated. The Schwentine River discharges near the head of the fjord.

Other than the detached dangers in the approaches and the shorebanks in the fjord, there are no dangers. All shorebanks are amply marked and there are sufficient navigational aids.

All of Kieler Förde was formerly a naval port. Kieler Hafen is that part of the fjord that lies southward of Friedrichsort; in it are located the commercial activities. The eastern terminus of the Nord-Ostsee Kanal is between Holtenau and Wik, on the western side of Kieler Hafen. There are port facilities at Vossbrook, close northward of the canal en-

trance; at Nordhafen, westward of the canal locks at Wik; at Admiral Scheer Hafen and Tirpitz Hafen, both immediately southward of the canal locks; at the entrance of the Schwen-tine River; and at the head of the fjord.

In the outer fjord there are small harbors at Strande and Laboe. In Kieler Hafen there are small harbors at Friedrichsort and Moltenort and also piers in various places on both sides of the fjord.

KIEL LIGHT (54° 30' N., 10° 16' 30" E.), is shown about 3 3/4 miles northeastward of Bulk Light. A radiobeacon transmits and a fog signal is sounded at the light. The light is also a pilot station for Kieler Forde. The following visual signals are displayed at the light: Two balls over a cone, point down, shown vertically by day and two red lights above a green light, 5 feet apart and shown vertically, indicate that an extraordinary obstruction exists in Kieler Forde.

TRAFFIC SEPARATION ZONE.—A Traffic Separation Zone, which inward or outward bound vessels should not enter, is located southeastward of Kiel Light. The zone is a narrow area commencing about 1 1/4 miles eastward of Kiel Light and extending in a southwesterly direction to about one mile southward of Kiel Light.

Submarine cable.—A submarine cable extends from Kiel Light in a southwesterly direction to the vicinity of Bulk Light. Buoys, marking the cable, are located about 1 mile, and 2 1/2 miles, respectively, southwestward of the light.

RADIO STATION.—Kiel radio station, with conspicuous radio masts, is located about 2 1/2 miles southwestward of Bulk. Three conspicuous radio masts, painted red and white, stand about 2 1/4 miles south-southwestward of the same point.

PILOTAGE

4C-3 Although pilotage in Kieler Forde is not compulsory it is advisable for vessels unacquainted with the regulations for the harbor of Kiel because the channel is narrow off Friedrichsort and there is considerable traffic.

Pilots are stationed at Kiel Light and Holtenau and can take vessels to any place in the fjord. They can also take vessels to adjacent fjords or to Danish waters. Pilots for the Baltic Sea can be obtained at Holtenau. Pilots are available day and night and can be ordered through the ship's agent, by telegram or radio to "Balticpilot Kiel", or by radio through Kiel Light.

Inward bound vessels, on leaving NEMEDRI Routes 1, 7 and 8, obtain pilots about 3/4 mile eastward of Kiel Light. Pilots leave outward bound vessels about 1 1/4 miles southeastward of Kiel Light.

Pilots come alongside in motor boats displaying the pilot flag or the prescribed lights.

Pilotage through the Nord-Ostsee Kanal is, in general, compulsory for all merchant vessels. For pilot signals, see H.O. Pub. 36, Eastern Shores of the North Sea.

Requests for pilots for Nord-Ostsee Kanal are made directly through Kiel Radio, and must be ordered 6 hours in advance, or if voyage of short duration, immediately after last departure.

REGULATIONS

4C-4 Special regulations governing navigation, speed, anchorage, and quarantine in Kieler Forde are in force. A copy of these regulations should be obtained from the Captain of the Port or his representative.

FISHERY

4C-5 Herring net fishing takes place in Kieler Forde during the entire year but chiefly from September to May. The outer ends of the nets are marked by red flags by day and by white lights at night, and the nets are drawn toward the shore.

DEPTHS AND DANGERS

4C-6 IN THE APPROACHES.—With few exceptions the depths in the approaches to the fjord are less than 10 fathoms. The shorebanks, as defined by the 5-fathom curve, off the entrance points are described in section 4C-1.

The outermost danger, Gabels Flach, lies about 6 1/2 miles northeastward of Bulk and consists of several shoal patches with depths of about 9.3 to 10.0 m (5.0 to 5.4 fm). A light buoy is moored on the eastern side of Gabels Flach.

Stollergrund, which lies on the western side of the approach, is described in section 4B-3. The eastern end of this bank, as defined by the 5-fathom curve, lies about 3 2/3 miles north-northeastward of Bulk and is unmarked.

Several wrecks with swept depths of 13.0 to 18.0 m (7.1 to 9.8 fm) lie within about 3 1/2 miles of the entrance points. The 13.0 m (7.1 fm) wreck lies about 3 1/4 miles northeastward of Bulk.

A small detached bank with a least depth of 3.8 m (2.0 fm) lies within about 2 miles northeastward of the eastern entrance point.

A former ammunition dumping ground lies within about 2 1/2 miles of the eastern entrance point. Spoil grounds, marked by buoys, lie within the limits of the former ammunition dumping ground.

OUTER FJORD.—Between Bulk and Friedrichsort, there are general depths of 6 to 10 fathoms and no detached dangers.

The shorebank, as defined by the 5-fathom curve, on the western side of the outer fjord consists mostly of foul ground with stones and trends irregularly. Strander Grasberg, the outer part of this shorebank, has a least depth of 3.7 m (2.0 fm) and extends up to 1 mile offshore from a position about 2 1/4 miles northward of Friedrichsort.

The shorebank, as defined by the 5-fathom curve, on the eastern side of the outer fjord extends up to 1 1/2 miles offshore and consists of stony foul ground in the northern part and sand in the southern part. A wreck with a swept depth of 3.4 m (1.8 fm) lies about 1 3/4 miles northeastward of Stein.

The shorebanks on both sides of the fjord in the vicinity of Friedrichsort are very narrow and steep-to.

The buoys marking the edges of the shorebanks also mark the channel; they are described in section 4C-10.

KIELER HAFEN.—Kieler Hafen has general depths of 5 1/2 to 12 fathoms and no detached dangers. The shorebanks off both shores vary in width from about 50 yards off projecting points to about 1/3 mile in the fjord recessions.

In the roadstead off the canal entrance there are depths of 6 1/2 to 7 1/2 fathoms. A depth of about 32 feet can be carried from the fjord approaches to the canal locks.

More information on depths is given with the description of the related features.

CURRENTS—WATER LEVEL

4C-7 Tides and currents in the fjord are negligible. The currents are influenced principally by the wind.

Winds from northwest through north to east-southeast raise the water level; winds from southwest through south to west-southwest lower the water level. Strong northeast winds raise the level by 6 1/2 feet; strong southwest winds lower the level by the same amount. The highest known water level is 9 1/2 feet above chart datum; the lowest, 7 1/4 feet below.

ICE

4C-8 As long as Kieler Bucht is not closed by ice the channel in Kieler Forde is kept open by heavy steamer traffic. The part of the harbor at the mouth of the Schwentine River is ice free longer than other parts of the fjord because of the river current.

Northeast gales drive in the ice and cause an almost impenetrable ice barrier across the narrows abreast Friedrichsort. Southwest winds drive the ice out of the fjord.

The dates of formation and disappearance of ice are given in table 6 in chapter 1.

APPROACHES

4C-9 The depths and dangers in the approaches are described in section 4C-6. Kiel Light is described in section 4C-2.

LANDMARKS.—From the offing the following are prominent on the western side of the fjord: Bulk Lighthouse; Friedrichsort Lighthouse; and Sprengel Mill, located on an elevation about 3 1/4 miles westward of Bulk.

On the eastern side of the fjord, the Naval War Memorial, northward of Laboe, is conspicuous.

Navigational aids.—A lighted buoy "Kiel", the approach buoy, is moored about 1 mile southward of Kiel Light. A lighted bell buoy "Kiel I" is moored about 2 1/2 miles southward of Kiel Light, and marks the eastern side of the entrance to the buoyed channel to Kieler Hafen.

The lighted whistle buoy off Bulk (sec. 4C-1) marks the western side of the entrance to the buoyed channel.

OUTER FJORD

4C-10 The channel in the outer fjord has depths of about 7 to 10 fathoms and is indicated by lighted and unlighted buoys, several with radar reflectors. In the vicinity of Friedrichsort Lighthouse the channel is less than 1/2 mile wide. A wreck with a swept depth of 8 1/4 fathoms lies in the channel about 1 mile north-northeastward of the lighthouse.

LANDMARKS.—The following are prominent landmarks: The fortress at Friedrichsort; the water tower on Moorberg; and Probstteierhagen Church, nearly 4 miles east-southeastward of Friedrichsort.

Friedrichsort Light is shown near the outer edge of the steep-to shorebank eastward of Friedrichsort. A fog signal is sounded here. A causeway extends from the light to the point eastward of Friedrichsort.

WESTERN SIDE OF THE OUTER FJORD.—A small fishing harbor enclosed by two moles is located at the village of Strande about 1 1/2 miles south-southwestward of Bulk. A light is shown on the east side of the entrance to this harbor and a red reflector on the west side of the harbor.

A small boat harbor is located about 1/2 mile southward of Strande.

Strander Bucht, the bight southward of Bulk, has anchorage in a depth of 9 fathoms; this anchorage is untenable during easterly winds. Foul ground lies about 1/4 mile offshore at the head of this bight.

EASTERN SIDE OF THE OUTER FJORD.—The coast northeastward of the village of Stein is low but westward of the village for a distance of about 1 1/2 miles it is steep.

At Stein there is a shallow boat harbor sheltered westward by a stone jetty.

A rectangular spoil ground marked at each corner with a buoy is located on the shorebank northwestward of Stein.

LABOE is a fishing village with a harbor formed by two stone breakwaters. Depths in the entrance are 4.2 to 5.2 m (13.7 to 17.0 ft.) and in the middle of the harbor, 3.9 to 4.4 m (12.7 to 14.4 ft.). A quay, 300 yards long with 2.3 to 3.7 m (7.5 to 12.1 ft.) along-

side, fronts the northern side of the harbor. There are a number of dolphins in this harbor. A mole extending northwestward from a position close southwestward of the southern breakwater forms a second basin in this harbor. Dolphins are also found in this basin.

Two light buoys, the northern one a lighted bell buoy, are moored close outside the shorebank northward and southwestward of Laboe. A light buoy is moored about 1/4 mile southeastward of Friedrichsort Light.

A light is shown on the head of the northern breakwater in Laboe. Storm signals are posted in the office of the harbormaster.

Jagersberg Pier extends about 300 yards offshore from a position 1/2 mile southward of Laboe. A foul area extends about 400 yards northward from the pier. A light shown from the head of Jagersberg Pier, in range 037° with a light shown about 1/4 mile north-eastward, leads into the approaches to the entrance to the Nord-Ostsee Kanal.

KIELER HAFEN

Position:	54°22'N., 10°10'E.
Depths:	Outer harbor, 10.1 to 16.8 m (5.5 to 9.2 fm). Inner harbor, 6.4 to 14.6 m (3.5 to 8.0 fm). Holtensau Reede, 11.9 to 13.7 m (6.5 to 7.5 fm). Canal locks, 13.8 m (45.2 ft.). Stickenhorn, 1.0 to 7.9 m (3.2 to 25.9 ft.). Nordhafen, 8.0 to 9.5 m (26.2 to 31.1 ft.). Admiral Scheer Hafen, 4.3 to 10.5 m (14.1 to 34.4 ft.). Tirpitz Hafen, shoal to 10.5 m (34.4 ft.). Schwentine River 3.7 to 13.6 m (12.1 to 44.5 ft.). Die Horn, 4.0 to 8.4 m (13.1 to 27.5 ft.).
Tides:	Negligible.
Port plans:	See section 4C-18.

4C-11 Kieler Hafen consists of three parts. The outer harbor lies between Friedrichsort and the shipyard northward of the entrance to the Schwentine River. The canal locks and Nordhafen at Holtensau and Wik are entered on the west side of the outer harbor. The inner harbor, which comprises the main commercial facilities, occupies the southern part of the fjord.

OUTER HARBOR

4C-12 FRIEDRICHSORT, a manufacturing town, has a small fishing harbor. An old fortress stands near the point eastward of the town. Storm and firing practice warning signals are shown by day and at night from a white mast on the point.

A PROHIBITED AREA marked by LIGHT BUOYS on the outer ends is located southward of the point at Friedrichsort. A light is shown from a dolphin in about the middle of this area; two other dolphins stand nearby. Several buoys marking a degaussing range are moored in this area.

A SUBMARINE CABLE crosses the fjord between the point at Friedrichsort and the opposite shore near the Submarine Monument at Moltenort. RANGE BEACONS on each shore indicate the direction of the cable.

A SUBMARINE PIPELINE extends from Friedrichsort, east-southeastward, to the opposite shore.

STICKENHORN, a harbor basin northeastward of the town of Vossbrook, is protected on its northeast side by a mole that extends nearly 400 yards offshore. There are depths of 0.6 to 9.8 m (1.9 to 32.1 ft.) in the outer part and 2.1 to 6.0 m (6.8 to 19.6 ft.) in the inner part of this basin. There are two berths in the southwestern corner of this basin.

A shoal with depths of 1.8 to 3.9 m (5.9 to 12.7 ft.) extends about 200 yards south-southeastward from the head of the mole. A light buoy is moored in about 5 fathoms at the outer end of this shoal.

Shoals and foul ground front the quay on the western side of the entrance to this basin to a distance of about 100 yards. A BUOY with a reflector is moored at the outer extremity of the foul ground.

Immediately southwestward of the entrance to Stickenhorn there is a sea wall about 930 feet long and with depths of 1.0 to 1.6 m (3.2 to 5.2 ft.) alongside. There is foul ground and wreckage alongside parts of this sea wall. This was formerly a seaplane base.

The village of Moltenort is located in the vicinity of the point on which stands the Submarine Monument. The fishing harbor of Moltenort consists of a small enclosed basin with depths of 3.6 to 4.1 m (11.8 to 13.4 ft.).

An AREA PROHIBITED TO ANCHORAGE AND FISHING is located off Moltenort. A

LIGHTED AND UNLIGHTED BUOY are moored in this area.

LIGHT BUOYS marking the fairway in the fjord are moored in depths greater than 6 fathoms off Moltenort and Kitzeberg, located about 1 1/4 miles south-southwestward.

HEIKENDORFER BUCHT lies between Moltenort and Kitzeberg and has depths of 7.0 to 12.0 m (3.8 to 6.5 fm). This bight affords anchorage to vessels when Holtenau Reede is fully occupied.

EASTERN ENTRANCE OF THE NORDOST-SEE KANAL

4C-13 The entrance to the canal lies between Holtenau and Wik and consists of two pairs of locks, the New Locks and the Old Locks. The Old Locks, on the north side of the entrance, are not in ordinary use. Vessels using the canal are limited in size to a length of 1,033 feet, breadth of 131 feet, mast height of 131 feet and a draft of 9.5 m (31.1 ft.) (1967). The canal Authorities are stationed at Holtenau.

HOLTENAU REEDE is for the use of vessels transiting the canal. The area northward of the canal entrance is for ANCHORAGE and the remaining area to the parallel of Nordmole is used as an approach fairway.

LIGHTS are shown on the northern and southern entrance points of the canal. One light is shown on the southeast point of Holtenau and the other is shown on the head of Nordmole. Sectors of the light on Nordmole indicate the western limit of the deep-draft anchorage in the roadstead and also the southern limit of the roadstead. A sector of the light at Holtenau is a guide for vessels approaching the roadstead and canal from southward.

HOLTENAU.—Eastward of the canal locks there is berthage for small vessels on the south and east sides of Holtenau. The quay on the south side of the town is about 900 feet long and has depths of 4.5 to 6.4 m (14.7 to 20.9 ft.).

On the east side of the town there is a small basin formed by a curved mole; the entrance to this basin is from southward. There is a berth about 400 feet long and with depths of 5.4 to 5.6 m (17.7 to 18.3 ft.) alongside the west side of the mole. The basin is used by small craft of the Canal Authorities.

There is a PILOT STATION on the east side of Holtenau a short distance northward of Holtenau Light. SIGNALS are shown from a black staff on a conspicuous reddish-brown tower at the pilot station.

A DEGAUSSING AREA in which anchorage is prohibited is located off the pilot station. A LIGHT BUOY is moored on the outer end of this area.

CANAL LOCKS—DEPTHS—TRAFFIC SIGNALS.—The New Locks are paired. Each lock has a useable length of 1,082 feet, breadth of 147 feet and a depth of 13.8 m (45.2 ft.) over the sill at mean canal water level. Mean canal water level is but slightly greater than chart datum in Kieler Forde.

Depths of 12.0 to 13.0 m (39.3 to 42.6 ft.) are in the approaches to the New Locks; the eastern entrance to the southern and northern locks have depths of 11.8 and 13.7 m (38.7 and 44.9 ft.), respectively.

TRAFFIC SIGNALS are shown in the locks, and CANAL REGULATIONS are in effect. Details of these as well as a full description of the Nord-Ostsee Kanal are found in H. O. Pub. 36, Eastern Shores of the North Sea.

NORDHAFEN (HOLTENAU—WIK)

4C-14 A fixed highway bridge, with a vertical clearance of 131 feet, crosses the canal about 1/2 mile westward of the canal locks. Nordhafen, lying westward of the bridge, has 3,600 feet of quayage on the southern side of the canal with depths of 8.0 to 9.5 m (26.2 to 31.1 ft.) alongside; coal and grain are handled. Binnenhafen, lying eastward of the bridge, has a quay on the southern side of the canal with 8.0 to 9.5 m (26.2 to 31.1 ft.) alongside and on the northern side of the canal a berthing space, fronted by dolphins, with depths of 9.0 m (29.5 ft.)

OUTER HARBOR (CONTINUED)

4C-15 ADMIRAL SCHEER HAFEN lies immediately southward of the canal locks and is formed by two moles, Nordmole and Sudmole. A pier projecting about 460 feet from the shore separates the harbor into two basins. The inner part of the harbor is quayed but has several piers, foul areas, and obstructions alongside; therefore it is used

only by small craft. The south side of Nordmole is about 960 feet long and has depths of 4.3 to 10.5 m (14.1 to 34.4 ft.). The north side of Sudmole is about 980 feet long. There is about 820 feet of berthing space here. Two dolphins are located off the head of Nordmole and four dolphins stand off the head of the central pier.

TIRPITZ HAFEN lies immediately southward of Admiral Scheer Hafen. It is protected on the east by Scheer Mole which extends south-southeastward from the head of Sudmole. Tirpitz Mole, which extends eastward from the shore protects Tirpitz Hafen on the south. A LIGHT is shown on the head of each mole. The entrance is about 525 feet wide with a depth of 10.3 m (33.7 ft.). Depths within the basin range from shoal to 10.5 m (34.4 ft.). Several jetties extend offshore from the western side of the basin.

Three buoys mark the southern limit of a dredged area southward of Tirpitzmole.

Between Tirpitz Hafen and Düsternbrook there are several jetties and small boat basins. A light is shown from the northeastern corner of an L-head pier close southward of Düsternbrook.

SUBMARINE CABLES.—A submarine cable crosses the fjord between the outer end of Sudmole and the shore close southward of Kitzeberg. RANGE BEACONS on each side indicate the direction of the cable.

Two submarine cables cross the fjord less than 1/2 mile northward of Düsternbrook; the direction of the cables is indicated by range beacons on each shore.

EASTERN SIDE OF THE OUTER HARBOR.—Between Kitzeberg and Howaldtswerke Shipyard, on the north side of the entrance to the Schwentine River, there are several jetties and quays. A number of DOLPHINS stand on the shorebank. About midway along this shore is Monkeberger Quay, about 1,000 feet in length and with depths of 20 to 25 feet alongside. A pier, with 30 feet at its head, extends about 230 feet offshore here. A short distance southward is Hasselfelde Quay, about 1,150 feet in length and with depths of 12 to 28 feet alongside.

A WRECK BUOY is moored in about 6 1/2 fathoms off Hasselfelde Quay. There is

another wreck buoy on the shorebank in the bight southward of Kitzeberg.

COMPASS ADJUSTMENT BEACONS are located between Kitzeberg and Monkeberger Quay. The front beacons consist of rectangular topmarks marked with figures denoting the magnetic bearing, except that denoting 118° , which is diamond-shaped; they stand about $1/4$ mile inland. The rear marker is a single beacon standing about $1/2$ mile inland. The northernmost range has a bearing of $117 1/4^{\circ}$ and the southernmost range has a bearing of $087 1/2^{\circ}$. Lights are shown from the rear marker and several of the front beacons.

The shipyard consists of two basins, several building slips, and two fitting-out berths. There are depths of 7.3 to 12.4 m (23.9 to 40.6 ft.) in the approaches to the basins.

The northwestern corner of the shipyard is in a state of disrepair and in danger of collapsing; this area is marked with three **BUOYS**. A jetty projects southwestward from a position close southward of the northwest corner of the shipyard.

INNER HARBOR

4C-16 The **SCHWENTINE RIVER** is limited to a navigable length of $3/4$ mile by a mill that spans the river. Although there are depths of 3.7 to 13.6 m (12.1 to 44.5 ft.) in the river, a depth greater than 5.2 m (17.0 ft.) cannot be carried to the mill. A stranded wreck lies on the shorebank on the south side of the entrance of the Schwentine River.

A submarine cable crosses the river about 700 yards within the entrance.

The fishing harbor on the south side of the river is quayed over a length of about 1,650 feet with depths of 7.2 to 8.4 m (23.6 to 27.5 ft.) alongside. There are two other berths near the mill that have depths of 3.1 to 5.2 m (10.1 to 17.0 ft.) alongside.

Three lighted mooring buoys, each painted in red and white checkers and fitted with a red reflector, are moored in midchannel abreast the entrance of Schwentine River.

BETWEEN THE SCHWENTINE RIVER AND DIE HORN, a distance of about 1 mile, lies the former naval dockyard which is more or less in a state of disrepair. There are four graving docks of a shipyard and a number of floating drydocks at the southern end of this area.

Three **BUOYS**, the northern and southern of which are lighted, mark the east side of the fairway off the dockyard.

DIE HORN occupies the head of Kieler Forde and lies between the city of Kiel and its suburb, Gaarden. This part of the harbor is entirely quayed and has depths ranging from shoal to 8.4 m (27.5 ft.) alongside.

There is a small basin on the west side of the entrance to Die Horn. A ferry crosses the harbor southwestward of this basin. A light is shown from the western terminal of the ferry crossing.

DIRECTIONS FOR KIELER FORDE

4C-17 BY DAY: From a position off Kiel Light, remaining clear of Traffic Separation Zone (4C-2), vessels should steer south-southwestward to pass eastward of Keil Lighted Whistle Buoy "A" and when Friedrichsort Light bears 200° vessels should steer for it until Kiel Light Buoy "5" is abeam. Thence vessels should steer to pass about 200 yards eastward of Friedrichsort Light and thence alter course toward the destination.

AT NIGHT: After passing Kiel Light, remaining clear of Traffic Separation Zone (4C-2), vessels should keep in the southwest part of the white fixed sector of Friedrichsort Light between the bearings of 202° and 209° until the light on Bulk changes from flashing to group flashing and bears 263° . After passing Kiel Lighted Whistle Buoy "A", vessels should change course southwestward into the white occulting sector of Friedrichsort Light between the bearings 195° and 202° and continue on this course until Kiel Light Buoy "5" is abeam. At this time, vessels should alter course to pass about 200 yards eastward of Friedrichsort Light and when Jagersberg lights are in range 037° astern, steer into the northern part of the harbor.

FACILITIES

4C-18 Kieler Forde has several communities lying along both shores. Stein, Laboe, and Moltenort are fishing villages on the eastern shore. The village of Strande, the town of Friedrichsort, and the community of Vossbrook lie on the western shore.

The head of the fjord is occupied by the city of Kiel and its suburbs. Holtenau and Wik are considered to be within the environs of Kiel. The city had a population of about 270,000 in 1960.

Until 1945, Kiel was Germany's principal naval port. Now it is becoming an important manufacturing and industrial area. Shipbuilding and ship repairs are the main pursuits and manufacture of machinery, light metals, precision instruments, chemicals, and textiles are other industries. The industry is concentrated on the east side of the fjord in the communities of Gaarden, Ellerbek, Wellingdorf, Neumuhlen, and Dietrichsdorf (the latter three being in the vicinity of the Schwentine River).

The commercial port activities are centered in the vicinity of the canal entrance, in the Schwentine River, and at the head of the fjord. There is a free port at Wik.

Kiel is a first port of entry.

Berths.—Stickenhorn has two berths in the southwest corner. The west berth is 390 feet long and has a depth of 7.2 m (23.6 ft.). The south berth is 360 feet long and has depths of 7.2 to 7.9 m (23.6 to 25.9 ft.). There are railroad tracks off the south berth.

The sea wall southwestward of Stickenhorn is 930 feet long and has depths of 1.0 to 1.6 m (3.2 to 5.2 ft.) alongside. A 20-ton fixed crane stands here.

Nordhafen: The west quay is 3,600 feet long and has depths of 8.0 to 9.5 m (26.2 to 31.1 ft.) alongside. There are a number of cranes with a capacity of 1 1/2 to 5 tons and two grain elevators with capacities of 200 and 100 tons an hour on this quay.

The east quay is 2,500 feet long and has depths of 8.0 to 9.5 m (26.2 to 31.1 ft.) alongside. Two bridge transporters with capacities of 2 1/2 and 3 tons are used for handling coal; there is also a conveyor with a capacity

of 80 tons an hour. There are oil bunkering facilities at the west end of this quay.

Both quays are served by the railroad.

Admiral Scheer Hafen: The south side of Nordmole is 960 feet long and has depths of 4.3 to 10.5 m (14.1 to 34.4 ft.) alongside. The north side of Sudmole has a usable length of 820 feet with a depth of 34 1/2 feet alongside. Two 3-ton cranes are located here. The quay along the shore is 550 feet long and has depths of 14 to 26 feet alongside; it is used only by small craft. There are railroad tracks on both moles. A 7-ton fixed crane stands on Nordmole. Nordmole is equipped for tank cleaning. Tankers, up to 50,000 tons, can discharge oil contaminated water ballast here.

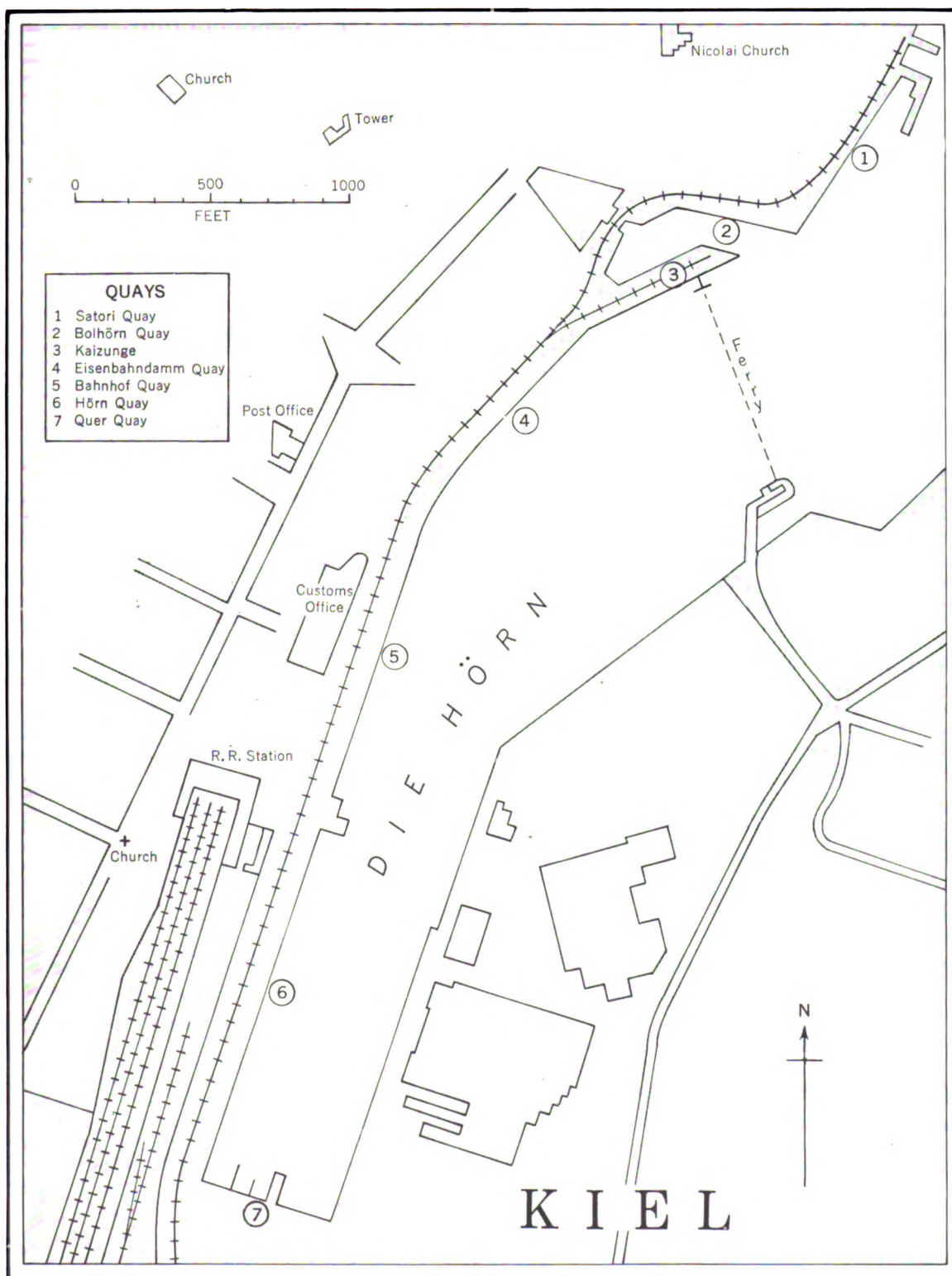
Tirpitz Hafen: The southern side of Sudmole is about 1,500 feet long and has depths of 7.6 to 10.4 m (24.9 to 34.1 ft.) alongside. The western side of the basin is quayed for about 1/2 mile and fronted by depths of shoal to 7.6 m (24.9 ft.); the northern part is used by police and the remainder by barges. Tirpitz Mole is about 1,650 feet long and has depths of 9.4 to 10.4 m (30.8 to 34.1 ft.) alongside.

Schwentine River: Fish Quay is 1,650 feet long and has depths of 7.2 to 8.4 m (23.6 to 27.5 ft.) alongside. It is used by the fishing fleet. Inner Quay is 500 feet long and has depths of 3.1 to 5.2 m (10.1 to 17.0 ft.) alongside. Silo Berth, a dolphin berth 300 feet long, has depths of 3.1 to 5.2 m (10.1 to 17.0 ft.) alongside and is equipped with a grain elevator with a capacity of 80 tons an hour.

Die Horn: These berths are on the west side of the harbor and are named in order from north to south.

Oslo Quay is about 900 feet long and has depths of 7.0 m (22.9 ft.) alongside.

Satori Quay is about 630 feet long and has a depth of 8.4 m (27.5 ft.) alongside.



Bolhörn Quay is about 800 feet long and has depths of 13 to 23 feet alongside.

Kaizunge has on its northwest side a berth about 350 feet long with a depth of 18 feet and on its southeast side a berth about 650 feet long with a depth of 22½ feet alongside.

Eisenbahndamm Quay is 885 feet long and has a depth of 23 feet alongside.

Bahnhof Quay is about 1,200 feet long and has depths of 23 to 26 feet alongside.

Hörn Quay is about 1,450 feet long and has a depth of 23 feet alongside.

Quer Quay, at the head of Die Höm, is about 450 feet long and has a depth of 13 feet alongside. A pier projecting from this quay divides it into two nearly equal parts.

Supplies.—Provisions and ship's stores are procurable. Water is supplied either at the quays or by barge. Fuel oil and coal are available in Nordhafen and in Die Höm. Oil may be supplied by barge. Diesel oil is available. Boiler water is available at Tripitz Hafen.

Repairs.—There are facilities for all kinds of ship repairs. There are four graving docks and a number of floating drydocks and marine railways; the largest graving dock is 1,018 feet long by 164 feet wide and has a depth of 6.0 m (19.6 ft.) over the sill. The largest floating drydock is 741 feet long by 115 feet wide and has a lifting capacity of 22,500 tons.

There are harbor and oceangoing tugs, floating cranes, lighters and barges, dredgers, and icebreakers. There is a 70-ton hammerhead crane at the shipyard. Divers and diving equipment are available. Salvage vessels are stationed here.

Communications.—All modern means of communication except an airport are available at Kiel. Several steamship lines in the Baltic-North Sea trade make Kiel a regular port of call.

Medical.—There are several hospitals in Kiel.

Deratting.—See section 1-7.

Compass adjustment services and degaussing can be carried out.

ANCHORAGES

4C-19 Strander Bucht.—See section 4C-10.

Heikendorfer Bucht.—See section 4C-12.

Holtenau Reede.—See section 4C-13.

Part D. KIELER FÖRDE TO FEHMARNBELT

4D-1 The eastern entrance point of Kieler Förde (54°26' N., 10°20' E.) is described in section 4C-1.

GENERAL REMARKS

4D-2 The German coast between Kieler Förde and the northwest point of Fehmarn, about 26½ miles east-northeastward, is described herein. This includes Hohwacht Bucht, the western approach to Fehmarnsund and its environs, Fehmarnsund, and the west side of Fehmarn. Fehmarnbelt lies between Fehmarn and the Danish island of Lolland.

The coast between Kieler Förde and the approach to Fehmarnsund, about 22 miles east-southeastward, is low and diked for about 4 miles and thence becomes higher and is backed by hills up to 420 feet in height. A number of streams drain this land and discharge into the sea. The churches in the various communities along this coast are good landmarks.

Hohwacht Bucht is the coastal recession at the eastern end of this coast. A short distance inland there are several lakes. Westward of the bay, occasional copses and isolated groups of trees can be seen. On the south and east sides of the bay, there are ranges of hills which in places descend steeply to the coast. The hills on the eastern side of the bay are bare and become noticeably lower as the approach to Fehmarnsund is neared.

The approach to Fehmarnsund is about 4 miles wide between the mainland and the southwest point of Fehmarn. The port of Heiligenhafen is located on the mainland side of this approach, and the port of Orth is located on the southwest side of Fehmarn, also in the western approach. Both ports have small harbors.

Fehmarnsund is the narrows that separate Fehmarn from the mainland. It is only about ½ mile wide in its narrowest part. The channel leading through the sound is about 4 miles long. The eastern part of this channel is narrow and is maintained by dredging. The eastern part of this channel is narrow and is maintained by dredging.

The west side of Fehmarn is low and treeless and a good part of it is diked.

Fisheries.—Extensive herring fishing is carried out in Hohwacht Bucht and around Fehmarn from May to November. The ends of the nets, which may be as much as 1 mile in length, are marked with light buoys.

Radiobeacons transmit from Neuland Light (sec. 4D-7) and Fehmarnbelt Lightship (sec. 5A-2).

Firing ranges.—Two overlapping firing ranges extend into Kieler Bucht from the coast westward of Fehmarnsund. Todendorf Range extends offshore about 11 miles as the sector of a circle centered on a position close westward of Neuland Light. Putlos Range occupies Hohwacht Bucht and extends about 7 miles offshore. The seaward limits of each range are marked by buoys, some of which are lighted. The ranges are closed to navigation when warning signals are displayed.

During firing exercises, warning signals are displayed as follows from signal stations at Friedrichsort, Haffkamp, Neuland Light, Putlos, Heiligenhafen, Flugge Light and from offshore patrol vessels:

Todendorf range, By day: two red cones, points upward, in a vertical line, surmounted by a red ball; at night, two white lights in a vertical line surmounted by a red light.

Putlos Range, By day: two red balls in a vertical line surmounted by a red cone, point upward; at night: two red lights in a vertical line surmounted by a white light.

DEPTHS AND DANGERS

4D-3 The pattern of soundings between this coast and the Danish islands is irregular and not a very good guide for navigation. The offshore depths with some exceptions are generally less than 10 fathoms. In addition there are interspersed throughout this area numerous foul patches, also marked and un-

marked wrecks. The wreck with the least depth, 5.5 m (3.0 fms), lies on the Danish side of Kieler Bucht, in a position about 5 1/2 miles south-southwestward of Dovns Klint (sec. 3D-10).

A steep-to rocky patch with a least depth of 5 fathoms lies in the approach to Fehmarnbelt in a position about 5 1/4 miles north-northwestward of Markelsdorfer Huk.

Between Kieler Förde and the approach to Fehmarnsund the shorebank as defined by the 5-fathom curve contains nearly all the dangers. Off the western shore, this coastal bank lies up to 2 miles offshore. In Hohwacht Bucht it may extend up to 1 1/4 miles from the western shore and less than 1 mile from the eastern shore. Two detached 5 3/4-fathom patches lie up to 3 miles offshore in the vicinity of the village of Schönberg.

Hohwacht Bucht has general depths of 6 to 10 fathoms.

The west side of Fehmarn is fronted by a shorebank that extends up to 4 1/4 miles offshore in its north and central part and up to 9 1/4 miles westward from the southwest point of the island.

In the western approach to Fehmarnsund there are general depths of 3 to 6 fathoms between the shorebanks. Several detached patches with depths of less than 3 fathoms lie on the southern side of this embayment. The least depth in the channel through Fehmarnsund is 5.5 m (18.0 ft.).

WATER LEVEL

4D-4 See section 4-2.

CURRENTS

4D-5 See section 4-3.

ICE

4D-6 See table 6 in chapter 1.

COASTAL FEATURES

4D-7 Between Kieler Forde and Neuland Light, a distance of about 10 1/2 miles, there are several prominent landmarks. Schonberg Church stands in the village of Schonberg about 2 miles inland in a position about 2 1-4 miles east-southeastward of Stein. Hessestein is a 56-foot tower standing on a 420-foot wooded hill about 2 3/4 miles southwestward of Neuland Light; it is visible over a great part of Kieler Bucht. Pils Berg, 436 feet high, lies a short distance southward. The churches at the villages of Lugjenburg and Blekendorf, located about 4 miles southward and 5 1/4 miles south-southeastward of Neuland Light, are conspicuous.

NEULAND LIGHT (54° 22' N., 10° 36' E.) and its adjoining buildings stand out prominently. A radiobeacon transmits from the lighthouse and there is a signal station here. Haffkamp signal mast stands about 2 miles west-northwestward of Neuland Light.

HOHWACHT BUCHT.—In this bay there is good anchorage in 8 to 9 fathoms during westerly and southerly winds.

The village of Hohwacht lies on the western side of the head of the bay and the village of Weissenhaus lies on the eastern side of the head of the bay. The church at Hohenstein, located about 1 1/2 miles southeastward of Weissenhaus, and the church and mill at Hansuhn, located about 2 3/4 miles south-southwestward of Weissenhaus, are prominent. The church at Oldenburg, about 4 miles east-southeastward of Weissenhaus, is equally prominent.

Putlos signal mast stands about 3 1/2 miles northward of Oldenburg church.

WESTERN APPROACH TO FEHMARN SUND

4D-8 This approach is entered between Stein Warder, a low narrow tongue of land on

the mainland, and Flugge, the southwest point of Fehmarn. With the exception of several small deeper patches, the depths here are less than 6 fathoms. In the approach channel there are general depths of 3 1/2 to 7 fathoms.

The mainland coast between Stein Warder and Papenort, the southern entrance point of Fehmarnsund located about 5 miles east-northeastward, is fringed by shoals. Eastward of the low island of Gras Warder there are numerous rocks on the shorebank. The port of Heiligenhafen lies southward of Gras Warder.

The coast between Flugge and Struckkampbuk, the northern entrance point of Fehmarnsund located about 3 miles southeastward, is a shallow bay in which lies the port of Orth.

NAVIGATIONAL AIDS.—Lights are shown at Flugge, Orth, and Struckkampbuk on the north, and at the port of Heiligenhafen on the south. A light is shown on the bridge at Fehmarnsund. A fairway buoy is moored in about 5 1/2 fathoms near the entrance to the buoyed channel in Fehmarnsund in a position about 2 1/4 miles south-southeastward of Flugge; this light buoy has an hourglass topmark and a radar reflector (see sec. 4D-10).

There is a signal station at Flugge Lighthouse and a tide gage on a post close southward of Flugge Lighthouse.

LANDMARKS.—On the mainland the following are prominent: the church and chimney in the town of Heiligenhafen; several mounds on the high land behind Heiligenhafen, the westernmost being the most conspicuous; the water tower on Gras Warder; the sanatorium at Warteburg, located less than 1 mile eastward of Heiligenhafen Church; and the church at Grossenbrode. The town of Heiligenhafen lies on the slope of the hill and cannot be seen by vessels approaching from westward until it is on a southerly bearing.

In Fehmarnsund the ferry piers and the red cable houses on both sides of the sound are prominent. The bridge at Fehmarnsund is conspicuous.

On Fehmarn the principal landmarks are Petersdorf Church, with a silo close westward of it, located about 3 miles northeastward of Flügge; Landkirchen Church, about $4\frac{1}{2}$ miles east-northeastward of Flügge; and Burg Church, about $6\frac{1}{4}$ miles eastward of Flügge.

Heiligenhafen ($54^{\circ}22' N.$, $10^{\circ}59' E.$), a small port used by coasters and fishing vessels, lies on the mainland southward of the western end of Gras Warder. It is approached around the eastern end of Gras Warder and thence through a dredged channel between the island and the mainland. The roadstead lies off the eastern end of Gras Warder.

There are depths of $16\frac{1}{2}$ to $29\frac{1}{2}$ feet in the approach channel and in the roadstead and a depth of 12 feet over a width of 52 feet in the dredged channel. Alongside the quay on the south side of the harbor there are depths of 2.5 to 4.0 m (8.2 to 13.1 ft.). The largest vessel using the port is 147 feet long and has a draft of 11 feet.

Continuous easterly winds may raise the water level as much as 2 feet and westerly winds may lower it the same amount. During the winter the dredged channel freezes sooner than the roadstead of Fehmarnsund. When there is heavy drift ice in the sound or Fehmarnbelt the roadstead affords good protection.

In the approach there are two buoys moored off the northern and eastern sides of the shorebank extending from Gras Warder. The northern buoy has a white reflector. Several detached patches with depths of 17 to 18 feet lie between about 1 and $1\frac{1}{4}$ miles northeastward of Gras Warder. A light is shown on the mainland southward of the east end of Gras Warder; a signal mast stands on a point about $1\frac{1}{2}$ mile west-northwestward of the light.

The roadstead affords good anchorage to small vessels in a depth of 7.0 m (3.8 fm), mud, with the lighthouse bearing 220° , distant $1\frac{1}{2}$ mile.

The entrance channel leads from the roadstead to the harbor and is marked with buoys.

The buoys on the northern side of the channel carry yellowish-white reflectors. A pair of lights in range $268\frac{1}{2}^{\circ}$ are shown in the harbor and indicate the fairway in the outer reach of the channel.

The harbor consists of two basins and is protected by a breakwater. The south side of both basins is quayed and has several berths, the longest being about 450 feet. A causeway leading from the breakwater connects the harbor with Gras Warder. Storm warnings are posted in the inner harbor.

A local pilot is available.

4D-9 Directions for entering Heiligenhafen.—*By day:* Vessels from westward should pass southward of the shorebank extending westward from Flügge. When the fall of the coast at Papenort is visible, vessels should steer for it until Grossenbrode Church bears 116° . Thence vessels should steer for the church on the latter bearing until Heiligenhafen Lighthouse bears between 197° and 212° . At this position, vessels should steer in on the latter sector to the roadstead and a position off the channel entrance. In the channel, the buoys serve as guides and the range lights in the harbor help to negotiate the entrance and the first reach of the channel.

At night: Vessels should steer in on Fehmarn Sund bridge light, keeping in the white sector until Heiligenhafen Light bears between 202° and 212° . Thence vessels should steer in on the latter sector to the roadstead off the channel entrance. A 6.1 m (20.0 ft.) rocky patch lies in the fairway of the latter sector.

Vessels without local knowledge should not attempt the channel at night.

The town of Heiligenhafen, with a population of about 10,000 (1966), is engaged in the manufacture of building materials and furniture and in food processing, and it is a station for the fishing fleet. Coal, coke, rocks, and fish are imported and grains are exported. There is a customs station in the town.

There is about 900 feet of berthage with a

depths of 2.5 to 4.0 m (8.2 to 13.1 ft.) along-side the quay on the south side of the harbor. It is served by the railroad.

Water and a small amount of diesel oil and provisions are available. There is a small marine railway with a lifting capacity of 100 tons. Repairs to small vessels and engines can be effected. Divers are available.

The town is connected with the general railroad system.

Orther Bucht indents the southwest coast of Fehmarn between Krumm Steert, a peninsula extending southeastward from the vicinity of Flügge Lighthouse, and Struckamphuk and is for the most part shallow. There is good **anchorage** during offshore winds for small vessels in about $2\frac{1}{2}$ fathoms in a position about $\frac{3}{4}$ mile eastward of the southeast end of Krumm Steert.

A **buoy** is moored in about $16\frac{1}{2}$ feet of water about $\frac{1}{2}$ mile southeastward of Krumm Steert and marks the edge of a steep-to bank extending from shore.

The harbor of **Orth** ($54^{\circ}27' N.$, $11^{\circ}03' E.$) is formed by two breakwaters extending southward from the shore. It is very narrow, being about 60 feet wide in the entrance and about 175 feet wide in its inner part. The harbor is approached through a dredged channel having a least charted depth of 2.1 m (6.8 ft.) (1969). The harbor and channel are subject to silting.

The entrance channel is marked by **buoys**. A pair of **light beacons** in range 349° stand at the head of the harbor and indicate the fairway in the entrance channel.

The fluctuation of the water level is similar to that at Heiligenhafen. The harbor freezes sooner than Kieler Bucht and the channels around Fehmarn, but it affords good shelter from drift ice.

The harbor has about 590 feet of berthage

on the east side of the inner part. Water and a small quantity of fuel oil are available. The berths are served by the railroad. There is a customs station in the harbor.

FEHMARN SUND

4D-10 Fehmarnsund is the passage between Fehmarn and the mainland. The buoyed channel is about 4 miles long and consists of two reaches. The western reach has a least depth of 5.5 m (18.0 ft.) in the fairway which favors the southern side of the channel. The eastern reach is a dredged cut about 200 yards wide and 5.8 m (19.0 ft.) deep.

Fehmarnsund Bridge, with a vertical clearance of 75 feet, crosses Fehmarnsund near the intersection of the reaches through the eastern and western entrances to the passage. A sector light is shown from the bridge; a fog signal is sounded.

Two rocky patches, with depths of 4.6 and 5.4 m (15.0 and 17.7 ft.), lie close eastward of the bridge and close southward of the range over the eastern reach.

Water level.—Northerly and easterly winds raise the water level and southerly and westerly winds lower it. The fall rarely exceeds 6 $\frac{1}{2}$ feet. The lowest level occurs with storms between south-southwest and west.

Vessels with drafts exceeding 16 feet should determine the level of the water from the tide gage at Fehmarnsund Ferry Harbor before transiting the sound.

Currents.—Winds from the north through east to south generate a westerly current and winds from south through west to north generate an easterly current; the rate seldom exceeds 2 knots. After a sudden shift in wind during stormy weather the wind and current sometimes oppose each other.

Ice.—The sound freezes only during very severe winters. When ice begins to form in adjacent waters, drift ice may be dangerous to vessels anchoring in the sound. At such times, it would be better to anchor in the road-

stead at Heiligenhafen or Orther Bucht. For more details, see section 4D-6.

Navigational aids.—The western approach buoy is described in section 4D-8. The eastern approach buoy, a light buoy with a double cross topmark, is moored less than $\frac{1}{2}$ mile southeastward of the eastern entrance of the eastern reach. Buoys with red reflectors mark the north side of the channel and buoys with white reflectors mark the south side of the channel. The buoys on the north side of the channel may carry cylindrical topmarks and those on the south side may carry black conical topmarks.

The white sector in Fehmarnsund Bridge Light indicates the channel in the western approach. The fairway through the eastern dredged reach is indicated by a range formed with Flügge Light, Struckamphuk Light and Fehmarnsund Bridge Light in line 305°.

A fog detector light is shown from the west ramp of the bridge.

Submarine cables cross the sound from the moles of each ferry harbor. Red cable houses on the heads of the moles indicate the position of the cables. Another submarine cable crosses the sound less than $\frac{1}{2}$ mile westward of the above cables; a pair of **beacons** on the mainland indicates the direction of the cable.

Prohibited anchorage.—Anchorage is prohibited in the vicinity of the submarine cables, on the range line in the western reach of the sound, and in the dredged channel.

Pilotage in the sound is not compulsory. Pilots are available at Heiligenhafen and at Burgstaaken (sec. 5C-6).

Directions for Fehmarnsund.—Vessels approaching Fehmarnsund from the westward

will first see Flügge Lighthouse and Petersdorf Church, and later Burg Church and Grossenbrode Church will come into view. A silo, 131 feet high, stands near Petersdorf Church.

Vessels should pass southward of the shorebank extending westward from Flügge and steer for Fehmarnsund Bridge Light bearing about 090°. This course leads to the fairway buoy off the western entrance to the sound. Vessels should now be guided by the buoys in the channel until reaching Fehmarnsund Bridge. At this position Flügge Lighthouse should be brought in range 305° with Struckamphuk Lighthouse, astern, and passage made through the dredged channel in the eastern reach of the sound.

Vessels approaching Fehmarnsund from Lübecker Bucht or Wismar Bucht will find that Burg Church in range about 007° with the granary at Burgstaaken will lead to the eastern entrance of the sound.

WESTERN SIDE OF FEHMARN

4D-11 The west coast of Fehmarn between Flügge and Markelsdorfer Huk, about 6 miles north-northeastward, is low and diked. Between the shore and the dike there are some marshes and a few lagoons. There are several villages near the coast and farther inland.

Wester Markelsdorf Light is shown about $\frac{1}{2}$ mile south-southwestward of Markelsdorfer Huk. The village of Wester Markelsdorf is located a short distance southward of the light.

A tide gage, connected to the shore by a cable, is located close inshore about $\frac{1}{2}$ mile west-southwestward of Wester Markelsdorf Light. Anchoring and fishing in the vicinity of the tide gage are prohibited.

ANCHORAGES

4D-12 Hohwacht Bucht.—See section 4D-7.

Heiligenhafen.—See section 4D-8.

Orther Bucht.—See section 4D-9.

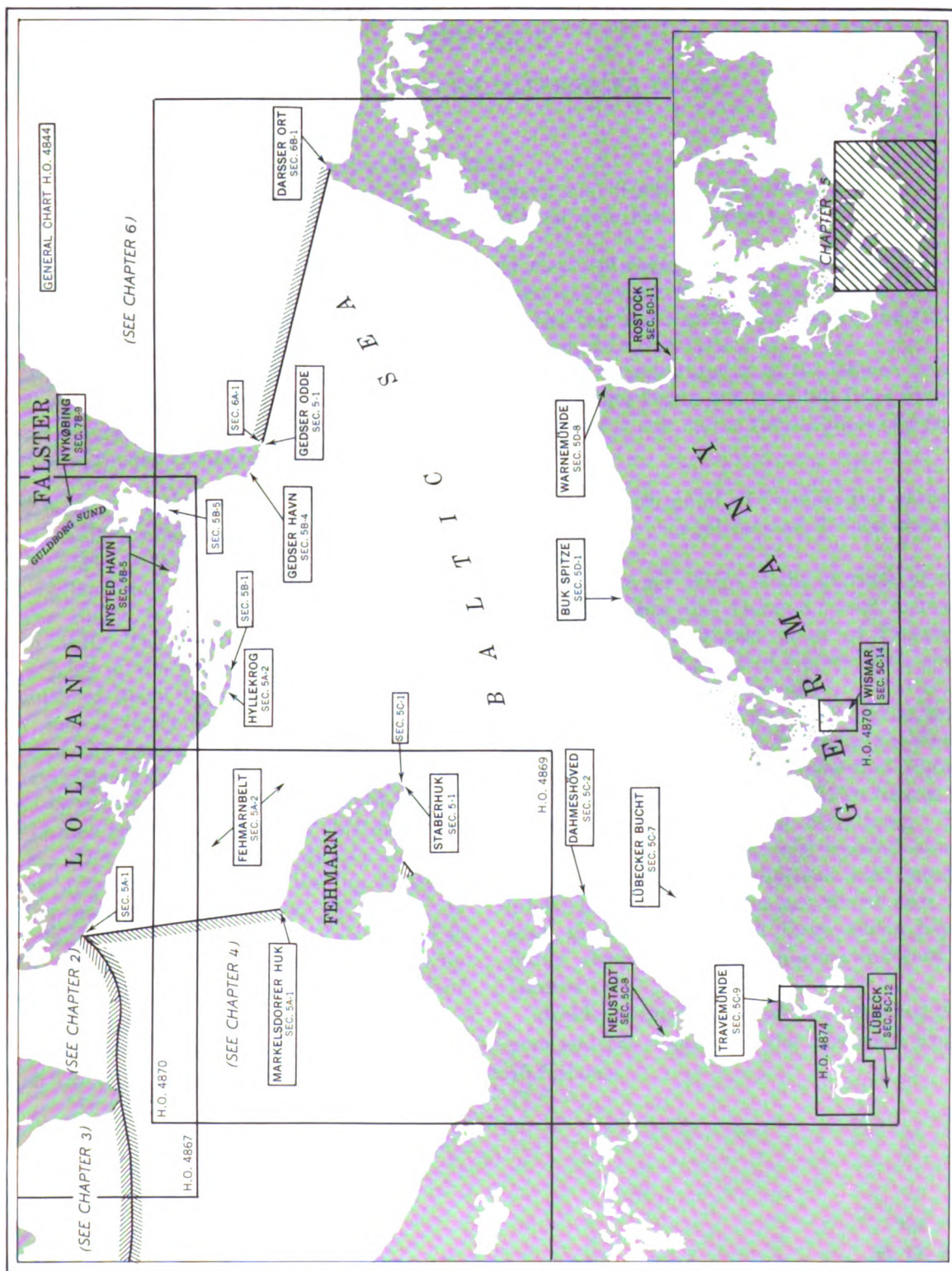


Chart limits shown are of the best scale charts issued to naval vessels by the U. S. Naval Oceanographic Office.
Section numbers refer to the place in the text where a description of the designated locality begins.

CHAPTER 5—GRAPHIC INDEX

CHAPTER 5

FEHMARNBELT AND MECKLENBURGER BUCHT

Part A. Fehmarnbelt

Part B. Fehmarnbelt to Kadet Rinne

Part C. Mecklenburger Bucht—Western and Southwestern Parts

Part D. Mecklenburger Bucht—Southern and Eastern Parts

Plan.—This chapter describes Fehmarnbelt and Mecklenburger Bucht. On the north it includes that part of the Danish islands that are contiguous to these two bodies of water. On the south it comprises that part of the German coast that lies between Markelsdorfer Huk, the north-west point of the island of Fehmarn, and the mainland point of Darsser Ort.

Both shores of Fehmarnbelt are described first, followed by a description of the Danish waters as far east as Gedser Odde. Thence the shores of Mecklenburger Bucht are described from Staberhuk to Darsser Ort. The sequence of description is from west to east on the Danish coast and from north to south and thence east on the German coast.

GENERAL REMARKS

5-1 Fehmarnbelt, known to the Danes as Femer Bælt, is the passage between Fehmarn and Lolland and provides access to Mecklenburger Bucht from Kieler Bucht and from Store Bælt. The passage is approximately 16 miles long in the middle of the fairway, has a width of about $9\frac{3}{4}$ miles in its narrowest part, and is fairly deep. The shores on both sides of the passage are low but not lacking in navigational aids and features.

Eastward of Fehmarnbelt, the south side of the Danish islands is fronted by shifting sandbanks, islets, and extensive shoals through which are shallow channels leading to small fishing harbors on the coast. The port of Nykøbing which is located on Falster and is described in chapter 7 may be approached by small craft through the shoal area by way of the southern part of Guldborg Sund.

Gedser Rev is a shorebank that extends about 9 miles southeastward from Gedser

Odde, the south point of Falster, and narrows the navigable channel between Falster and the German coast.

Mecklenburger Bucht is the expanse of water that fronts the German coast between Staberhuk, the southeast point of Fehmarn, and the mainland point of Darsser Ort, about $42\frac{1}{4}$ miles east-northeastward.

The west coast of the bay is low-lying, bare, and diked along much of its length; the southwest and south coasts are somewhat higher, steeper, and more wooded and are backed by wooded hills of moderate elevations. The southeast and east coasts are wooded almost everywhere and dunes alternate with wooded hills. Lagoons and lakes are found near the coast in many places. A large inland bay is found about 5 miles south-southwestward of Darsser Ort.

Mecklenburger Bucht has few detached dangers and the depths for the most part exceed 10 fathoms.

Lübecker Bucht with Neustädter Bucht occupy the southwestern part of Mecklenburger Bucht and form a commodious inlet. The Trave River discharges into the head of the inlet. The port of Travemünde lies at the mouth of this river and the port of Lübeck lies about 11 miles up the river. The northern terminus of the Elbe-Trave Kanal is at Lübeck. The small port of Neustadt is located in the northern part of Neustädter Bucht.

Wismar Bucht, a poorly defined and shoal-filled bay, indents the coast immediately eastward of Lübecker Bucht. The port of Wismar is located at the head of this bay. Insel Poel lies on the eastern side of the bay and provides some shelter to the port.

To Warnow River discharges into Mecklenburger Bucht about $23\frac{1}{2}$ miles southwestward of Darsser Ort. The port of Warnemünde occupies the mouth of this river and the port of Rostock lies about 5 miles up the river. This river is navigable by small vessels as far as Butzow, about 13 miles south-southwestward of Rostock.

Kadet Rinne, known to the Danes as Kadetrenden, lies about midway between Gedser Odde and Darsser Ort and is the deepest part of the channel leading into Mecklenburger Bucht. It is about 15 miles long, about 1 to 3 miles wide, and has general depths of 10 to 16 fathoms. In this channel there are several patches; the shoalest has a depth of $7\frac{1}{4}$ fathoms.

There are numerous navigational aids in this area. Radiobeacons transmit from Fehmarnbelt Lightship, Gedser Rev Lightship, at Ohlenburgs Huk on Fehmarn, at Travemünde, and at Warnemünde.

Submarine cables are laid in Fehmarnbelt and in Mecklenburger Bucht between Warnemünde and Gedser Odde.

Note.—The boundary of Soviet-occupied Germany lies about $\frac{1}{2}$ mile eastward of the

entrance to the Trave River. The waterway to Lübeck is not in the Soviet-occupied area.

Fisheries.—Extensive herring fishing is carried on from May to November off the north and east coasts of Fehmarn and in the western part of Mecklenburger Bucht. From December to the middle of April, fishing with dredge nets is carried on over a large area in Lübecker Bucht.

WATER LEVEL

5-2 The factors governing the fluctuation of the water level in this area are about the same as those experienced in Kieler Bucht. This information is given in section 4-2. In general, the water level may rise up to 4 or 6 feet during winds between a northerly and northeasterly direction and may be lowered a like amount during winds between a south-southwesterly and westerly direction.

CURRENTS

5-3 In Fehmarnbelt, during calm weather the currents generally set in the direction of the passage, either west-northwestward or southeastward. However, these currents may be deflected to the north or to the south by the influence of the wind. Instances of vessels grounding to the southward and southeastward of Hyllekrog, on Lolland, tend to indicate the existence of a northerly set, and vessels stranding near Ohlenburgs Huk and on Puttgarden Riff, off Fehmarn, are probably caused by the westerly current being deflected to the southward in the eastern entrance of the passage.

During calm weather the rate of current may be up to 1 and 3 knots; during gales it may increase up to 5 knots.

From observations taken aboard the Fehmarnbelt Lightship over a number of years, it was found that the current set in an east-southeasterly and southeasterly direction twice as

often as it set in a westerly and west-north-westerly direction. The average rate of the currents was about 1 knot. No current was observed about 10 percent of the time.

In the vicinity of Kadet Rinne the currents follow the direction of the passage and set southwestward or northeastward. It has been observed aboard the Gedser Rev Lightship that the current sets in a general southwesterly direction almost twice as often as it sets in an easterly direction.

The average rate of the current at Gedser Rev Lightship is about $\frac{1}{2}$ to $\frac{3}{4}$ knot but in some instances, particularly under the influence of the wind, the rate may increase up to 2 knots in the direction of the wind. The strongest current observed off this lightship set southwestward at a rate of 4 knots during a west-northwesterly gale.

The directions and velocities of the currents in this part of the Baltic Sea are shown in figures 2 through 10.

ICE

5-4 As in other areas within this volume, ice forms along the shores sooner than in the open waters. It is only during severe winters that the open waters of the Baltic Sea are frozen over. During the ice season, concentrations of drift ice may be encountered moving toward the passages leading toward the Kattegat.

In the sea area off Fehmarn the first ice may be seen about the first or second week of January; in the sea area off Darsser Ort the first ice may be seen during the last week of December. The harbors at the river mouths in Mecklenburger Bucht may get the first ice as early as the middle of November.

See chapter 1 for more ice information. Details of ice for individual ports are given with the respective description.

Part A. FEHMARNBELT

5A-1 Markelsdorfer Huk ($54^{\circ}32' N.$, $11^{\circ}04' E.$), the northwestern extremity of Fehmarn, is low and backed closely by a lagoon. It is also the south point of the western entrance to Fehmarnbelt. The depths in the vicinity of the point are fairly regular, and the 6-fathom curve lies less than 2 miles northward of the point.

The north point of the western entrance to Fehmarnbelt ($54^{\circ}45' N.$, $11^{\circ}01' E.$) is the unnamed southwest end of Lolland; it is also the southern limit of Store Bælt. This ill-defined point lies about $13\frac{1}{2}$ miles north-northwestward of Markelsdorfer Huk and can be identified by the conspicuous Kappel Church lying nearly $1\frac{1}{4}$ miles northeastward. The depths off this point are somewhat irregular, and the 6-fathom curve lies up to 5 miles offshore.

GENERAL

5A-2 Fehmarnbelt lies between the southwest side of Lolland and the north and east coasts of Fehmarn. The western entrance points are described in section 5A-1. The eastern limit of the passage is between Staberhuk, on Fehmarn, and Hyllekrog, a small low island located off the southern end of Lolland. There are general depths of 10 to 16 fathoms in the passage. Some foul patches, several wrecks, and a 31-foot rocky patch, Øjet, are found in the channel.

Both shores are low. The prominent landmarks on both sides of the passage are the churches that are located up to $3\frac{1}{4}$ miles inland, the lighthouses near Markelsdorfer Huk, off Ohlenburgs Huk, at Staberhuk, and at Hyllekrog, and the 147-foot red and white radio mast located about $1\frac{1}{2}$ miles westward of Ohlenburgs Huk. Rødby Havn is the only harbor in Fehmarnbelt.

Submarine cables cross Fehmarnbelt between Puttgarden and Rodby Havn.

FEHMARNBELT LIGHTSHIP (54° 36' N., 11° 09' E.) is moored in about the middle of the passage about 4 3/4 miles northeastward of Markelsdorfer Huk. The lightship sounds a fog signal, transmits a radiobeacon, and is a signal station, day and night.

During the ice season the lightship is replaced by a black and red conical buoy marked "Fehmarnbelt" in white.

CAUTION.—Deep-draft vessels are advised to navigate in depths greater than 20.0 m (10.9 fm) in Fehmarnbelt.

DEPTHS AND DANGERS

5A-3 OFF FEHMARN.—The 10-fathom curve lies from 1 1/2 to 2 1/4 miles off the north coast and up to 3 miles off the east coast of this island.

OFF LOLLAND.—The 10-fathom curve lies about 9 miles offshore near the western entrance of the passage and from 3 1/4 to 4 1/4 miles off the greater part of the remainder of the southwest coast. Ojet, a steep-to 31-foot rocky patch, lies near the outer end of this 10-fathom bank in a position about 5 1/4 miles north-northwestward of Markelsdorfer Huk. The channel between the 10-fathom curves near Ojet is only about 1 1/2 miles wide.

WRECKS.—There are several wrecks in the passage between the 10-fathom curves. The wreck with the least water, a swept depth of 14.0 m (7.6 fm), lies about 9 miles east-northeastward of Staborhuk. A dangerous wreck lies about 2 3/4 miles south-southwestward of the above wreck.

The dangers on the shorebanks within the 10-fathom curve are described with the coastal features.

WATER LEVEL

5A-4 See section 5-2.

CURRENTS

5A-5 See section 5-3.

ICE

5A-6 OFF OHLENBURGS HUK the first ice may appear on the average during the third week of January. This ice may disappear on the average by the third week of March.

Off Hyllekrog the first ice may appear on the average during the middle of January. This ice may disappear on the average by the middle of March.

See table 6 in chapter 1 for additional data.

NORTH AND EAST COASTS OF FEHMARN

5A-7 The north coast between Markelsdorfer Huk and Ohlenburgs Huk, distant about 6 3/4 miles, is low and protected by a dike. A chain of lagoons lies close to the shore along the greater part of this coast.

The 5-fathom curve, within which are contained all the dangers, lies up to 1 1/2 miles offshore. Puttgarden Riff, a steep-to shoal with stones on it, extends about 1 mile offshore in a position about 2 miles northwestward of Ohlenburgs Huk. There are several wrecks on this dangerous shoal.

PUTTGARDEN FERRY HARBOR, located about 1/2 mile north-northwestward of Marienleuchte Light, is formed by 2 breakwaters on which lights are shown and is used by the ferries operating between Fehmarn and Rodby Havn on Lolland. Range lights in line 205° lead into the harbor. A fog signal is sounded on the head of the west breakwater. Two light buoys are moored about 1/4 miles northward and 1/4 miles northeastward, respectively, of the ferry harbor.

Good landmarks on this coast are Petersdorf Church, located nearly 3 1/2 miles southward of Markelsdorfer Huk; Bannesdorf Church, located about 1 3/4 miles south-southwestward of Ohlenburgs Huk; a chimney located nearly 1 1/2 miles southwestward of the latter point; and the 147-foot radio mast described in section 5A-2. A beacon, used by the Fehmarnbelt Lightship to maintain position, stands on the coast about 1 1/2 miles eastward of Markelsdorfer Huk.

Marienleuchte Light is shown from a position near Ohlenburgs Huk; signals are displayed from the lighthouse. A radiobeacon transmits from a tower close southward of the lighthouse when Fehmarnbelt Lightship is withdrawn. A yellow, four-sided tower stands about 200 yards southeastward of the

lighthouse. A tide gage is located at the boat landing off Ohlenburgs Huk.

The EAST COAST between Ohlenburgs Huk and Staberhuk, distant about 6 miles, is steep, and in the southern part there are some hills with elevations up to 84 feet.

The shorebank is defined by the 5-fathom curve extends up to about 1 2/3 miles offshore in the northern part and less than 1 mile to about 1 mile in the southern part. There are stones and foul ground on this shorebank.

During offshore winds there is good ANCHORAGE for small vessels in 3 1/4 to 3 3/4 fathoms, stiff light-blue clay, abreast the village of Pressen; the latter is located about 1 mile southward of Ohlenburgs Huk. A submarine cable from Sweden is landed at Pressen.

STABERHUK LIGHT stands on Staberhuk. A FOG SIGNAL is sounded nearby. A TIDE GAGE stands close southward of the lighthouse.

SOUTHWEST COAST OF LOLLAND

5A-8 The southwest coast of Lolland between Store Bælt and Hyllekrog, a distance of about 20 miles, is low and protected by a dike. Most of the coast consists of fields interspersed with wooded areas; there are a few dwellings near the coast.

The 5-fathom curve lies nearly 3 miles offshore near the entrance to Store Bælt but elsewhere it lies up to 2 miles or less offshore. There are several detached shoal patches seaward of the 5-fathom curve but nowhere are there any dangers more than 3 miles offshore.

A WRECK with a depth of 6 fathoms lies about 3 1/2 miles southward of Rødbby Havn.

Prominent landmarks along this coast are the churches at Kappel, Dannemare, Landet, Vejleby, Tirsted, and at the town of Rødbby.

A light is shown in about the middle of the low and narrow island of Hyllekrog. A lattice-work mast, 393 feet high, is located about

3 miles north-northeastward of Hyllekrog Light. Lights are also shown in Rødbby Havn.

DANGER AREA.—A danger area about 15 miles long, west-northwestward and east-southeastward, and about 2 3/4 miles wide at its widest part, lies with its outer extremity nearly 5 miles off the southwestern coast of Lolland. This area extends to within about 3 miles of Keldsnor Light (sec. 2C-6), near the southern end of Langeland.

Rodby Havn (54° 39' N., 11° 21' E.), is an artificial harbor, formed by two breakwaters, consisting of 4 basins. The buoyed channel leading into the harbor is marked by range-lights and dredged to a depth of 8.0 m (26.2 ft.). The depths in the harbor entrance vary due to silting and shifting sands.

Northeast gales raise the water level as much as 5 feet and southwest gales lower it about 4 feet. Ice has been observed in the harbor as early as the middle of November.

Lights are shown on the breakwater heads and the ferry slips within the harbor. FOG SIGNALS are sounded at the front range light and the southern breakwater head.

The ferry slips are dredged to 8.5 m (27.8 ft.), elsewhere in the harbor, depths range from 2.4 to 8.0 m (7.8 to 26.2 ft.). The quays are served by the railroad and water is piped to them. Provisions are available. The harbor has custom service. Pilots are available.

ANCHORAGE

5A-9 OFF PRESSEN.—See section 5A-7.

PART B. FEHMARNBELT TO KADET RINNE

5B-1 HYLLEKROG (54° 36' N., 11° 31' E.) is described in sections 5A-2 and 5A-8.

GENERAL

5B-2 This part describes the Danish coast and waters between Hyllekrog and Gedser Odde, about 16 1/2 miles eastward. It includes Gedser Rev and Kadet Rinne.

The coastal recession between Hyllekrog and Gedser Odde is shallow almost throughout and has several islets in its western part. Rødsand, a shifting sandbank that is mostly awash, lies between the entrance points of this recession. A few islets that change in shape and position stand on the sandbank.

There are two accesses to this embayment. Østre Mærker is the channel that leads over the sandbank about midway between the entrance points. Rødsand Rende and thence Kroghage Dyb, both immediately southward and westward of Gedser Havn, form the other access.

Nysted, a small harbor on the south coast of Lolland, and Gedser Havn, on the southern end of Falster, are the only places of any significance. Nykøbing can be reached by small craft through the southern extension of Guldborg Sund, between Lolland and Falster.

Lights are shown on Gedser Odde and in its vicinity and also in the port of Nysted.

GEDSER REV LIGHTSHIP (54° 27' N., 12° 11' E.) is moored in about 11 fathoms off the southeast end of Gedser Rev in a position about 9 3/4 miles southeastward of Gedser Odde. The lightship sounds a FOG SIGNAL and transmits a RADIOBEACON.

DEPTHS AND DANGERS

5B-3 Excepting several wrecks and Gedser Rev, the coastal dangers are inside the 10-fathom curve. This curve follows a general east-southeasterly direction from about 3 miles southward of Hyllekrog to about 6 miles southward of Gedser Odde. The 5-fathom curve lies from 1 1/4 to 2 3/4 miles inshore of this 10-fathom curve.

GEDSER REV is a steep-to coastal bank, as defined by the 6-fathom curve, that extends about 9 miles southeastward from Gedser Odde. The bottom is limestone covered with sand and stones. There are a number of detached shoal patches, with depth of 6 to 18 feet, that have deeper water between them. BUOYS are moored at the

southeastern ends of these shoal patches in positions about 4 1/2, 5 1/2, and 8 1/2 miles southeastward of Gedser Odde.

A dangerous wreck lies about 10 miles south-south-eastward of Gedser Odde. A dangerous wreck lies about 4 miles farther east-northeastward. A wreck with a depth of 3 1/4 fathoms lies about 8 miles southeastward of Gedser Odde. There is a dangerous wreck about 2 miles and 5 1/2 miles, respectively, east-southeastward of Gedser Odde. A wreck with a depth of 2 3/4 fathoms lies about 4 miles east-south-eastward of Gedser Odde. The other wrecks in this area have depths greater than 7 fathoms.

A 6-fathom spot lies about 11 miles south-eastward of Gedser Odde.

COASTAL FEATURES

5B-4 LANDMARKS.—The south side of Lolland is low and consists of fields and wooded areas. In addition to the port of Nysted there is a small fishing harbor at Errindlev Havn located about 3 1/2 miles north-northeastward of Hyllekrog.

At the port of Nysted the following are prominent: Aalholm Castle, with a truncated and pointed tower, standing on the west side of the port; Aalholm Beacon, a 72-foot mast with a black ball topmark, located about 1/2 mile southward of the castle; and the church in the town of Nysted.

The southern end of Falster is low on the southwest side, but there are low cliffs at Gedser Odde, the southeast end.

The prominent landmarks on Falster are: Gedesby Church, a white building with a red roof, located 2 3/4 miles north-northwestward of Gedser Odde; Skelby Church, a dark building with a black steeple, located about 5 miles north-northwestward of Gedser Odde; and the buildings on Gedser Odde and in Gedser Havn.

GEDSER LIGHT is shown about 1/2 mile northwestward of the extremity of Gedser Odde. LIGHTS are also shown on the east side of Rødsand Rende and in Gedser Havn.

SUBMARINE CABLES.—A submarine cable is laid from the vicinity of Gedser Light to

Warnemünde. A submarine cable is laid to the outer light in Rødsand Rende from the shore. The landing places of these cables are indicated by **beacons**. A **warning signal** against anchoring in the vicinity of the cables is made at Gedser Light.

Østre Mærker, the western channel over Rødsand, is entered about 8 miles east-southeastward of Hyllekrog Light and has a least depth of 2.5 m (8.2 ft.). It leads into the deeper water northward of Rødsand and is one of the approaches to the port of Nysted and Guldborg Sund. The entrance and sides of this channel are marked by buoys, which are moved as the channel changes.

Schønheyders Pulle, a stony patch with a least depth of 12 feet, lies about 4 miles southwestward of Gedser Odde; a **buoy** is moored in about 21 feet on the south side of this patch.

Rødsand Rende, the eastern channel over Rødsand, is entered about $1\frac{1}{2}$ miles southwestward of Gedser Odde and leads northward to Kroghage Dyb, off Gedser Havn, wherefrom a channel leads to the deeper water northward of Rødsand. The channel has a depth of 6.2 m (20.3 ft.) over a width of 490 feet. The approach buoy, a lighted whistle buoy is moored about 3 miles southward of Gedser Odde. Farther in, the channel is well marked on both sides by buoys. Several detached shoals with depths of 3 fathoms and less lie on either side of the approach to the channel entrance.

On the east side of the channel at intervals of about $\frac{1}{2}$ mile there are three **lights**. The outer light sounds a **fog signal** and displays a **warning signal** against anchoring in the vicinity of the submarine cables. Two lights in range $350\frac{1}{2}^\circ$ are shown in Gedser Havn and indicate the fairway in Rødsand Rende.

Kroghage Dyb, with a least depth of 13 feet, is a narrow channel entered close southward of Gedser Odde. It leads southward and westward of the extremity of the peninsula to the

deeper water northward of the eastern end of Rødsand. **Buoys** mark the channel southeastward and southward of Gedser Havn and also in the western entrance.

There is **anchorage** for small vessels in 24 feet, sand and clay, close southeastward of Gedser Havn, but strong onshore winds raise a sea here. The small roadstead westward of the southern end of Falster affords shelter from easterly winds and the holding ground here is good.

Gedser Havn, the Danish terminus of the train ferry from Warnemünde, is an artificial harbor that is nearly enclosed by two breakwaters. The entrance is about 300 feet wide. The harbor is divided into two basins by a projecting mole; the western basin has two ferry slips and berths along the quay. Depths in the western basin are 5.0 to 6.3 m (16.4 to 20.6 ft.) and 4.0 to 5.5 m (13.1 to 18.0 ft.) in the eastern.

Northeast winds may raise the water level as much as 6 feet and southwest winds may lower it 5 feet. The current outside the harbor follows the direction of the wind, but with a strong easterly set there is sometimes a countercurrent across the harbor entrance. Onshore gales send a sea into the harbor. Ice has been observed here as early as the middle of December.

In addition to the range lights, there are other **lights** shown in the harbor and a **fog signal** is sounded on the east breakwater.

Pilots for Rødsand Rende and Gedser Havn are available from Nykøbing (sec. 7B-9) with an advance notice of 6 hours.

The town of Gedser with a population of about 1,195 (1965) adjoins the harbor. Water and provisions are available. It is connected to the general railroad system. A salvage vessel is generally stationed here. The harbor has customs service.

5B-5 Nysted Havn and approaches.—The small port of Nysted lies on the east side of a small inlet on Lolland about $8\frac{3}{4}$ miles northwestward of Gedser Havn. The town is fronted with wharves having depths up to $10\frac{1}{4}$ feet and there are three mooring piles off the wharves. A pier with a depth of 8 feet at its head and with two dolphins off it is located about $\frac{1}{4}$ mile southward of the town.

The harbor is approached from seaward either through Østre Mærker or Kroghage Dyb, both of which lead to a spacious roadstead. Kroghage Dyb has a least depth of 15 feet westward of Gedser Havn and the roadstead has general depths of 12 to 25 feet.

From a position about 1 mile southward of Flinthorne Odde, the southeastern extremity of Lolland located about 6 miles northwestward of Gedser Havn, there is an intricate channel, with a fairway depth of 4.4 m (14.4 ft.), that leads between the shoals to the dredged channel in the immediate approach to the inlet and harbor. The dredged channel has a depth of 3.7 m (12.1 ft.). Spar buoys mark the outer channel and perches mark the dredged channel.

There is good **anchorage** anywhere in the roadstead. Northwest winds raise a sea here; when this wind is blowing the best anchorage is near the Falster shore off Skelby.

An occasional light is shown from the eastern entrance point of the inlet of the port.

The tidal range in the harbor is only about 2 feet, but northeasterly gales may raise the water as much as 4 feet and westerly gales may lower it up to 5 feet. Easterly winds may set up an incoming current and westerly winds may set up an outgoing current.

Pilots are available.

The town of Nysted has a population of about 1,300 (1965) and is connected with the railroad system. There is a customs office near the harbor. Water, provisions, coal, and some

oil are available. Repairs to small vessels can be effected.

Directions for Nysted.—It is advisable to engage a pilot whether using Østre Mærker or Kroghage Dyb as the fairway in the immediate approach to Nysted is narrow and winding.

Through Østre Mærker: Vessels should approach this buoyed channel from southward. When Aalholm Beacon bears 358° and is seen midway between the two towers of Aalholm Castle, vessels should steer in on it until northward of Rødsand, whence they should steer for Flinthorne until Gedser Light bears 123° . Thence vessels should steer northwestward and north-northwestward through the buoyed channel until Skelby Church comes in range 097° with the eastern of two islets off Flinthorne.

With the latter range astern, vessels should steer westward until Aalholm Beacon comes in range 311° with a redoubt on the eastern entrance point of the inlet and thence steer in on this range to the dredged channel.

Through Rødsand Rende and Kroghage Dyb: Vessels should approach Rødsand Rende from the southward on the range ($350\frac{1}{2}^\circ$) in Gedser Havn and be guided by the buoys in the channels as far as Gedser Havn. Thence vessels should round the southwest point of Falster and enter the roadstead. When Gedser Light bears 123° , vessels should steer northwestward with the light seen astern to the entrance of the intricate channel, wherefrom vessels should proceed as directed previously.

Southern approach to Nykøbing.—A very narrow and winding channel with a least depth of about 7 feet leads to Nykøbing from the northeast part of the roadstead northward of Rødsand. This channel is about 7 miles long and requires the services of a pilot. Pilots are able, as a rule, to conduct vessels through the channel with a draft of up to $7\frac{1}{4}$ feet. The fairway is marked with buoys.

Kadet Rinne is described in section 5-1. Kadet Bank and the dangers on the southeast side of this channel are described in sections 6B-1 and 6B-6.

ANCHORAGES

5B-6 Off Gedser Havn.—See section 5B-4.

Northward of Rødsand.—See section 5B-5.

Part C. MECKLENBURGER BUCHT— WESTERN AND SOUTHWESTERN PARTS

5C-1 Staberhuk ($54^{\circ}24' N., 11^{\circ}19' E.$), the western point of Mecklenburger Bucht, is described in section 5-1.

GENERAL

5C-2 This part describes that part of Mecklenburger Bucht that is engulfed between Staberhuk and Buk Spitze, about $19\frac{3}{4}$ miles southeastward.

The western part of Mecklenburger Bucht forms the eastern and southern approaches to Fehmarnsund (sec. 4D-10). It includes the south coast of Fehmarn and the mainland coast as far southward as Lübecker Bucht; the whole is contained in the indentation between Staberhuk and Dahmeshöved, about $14\frac{1}{2}$ miles southwestward.

The south coast of Fehmarn and the mainland are for the most part low-lying and fairly bare, but in some places the land rises a short distance inland and there are wooded areas. The beach in the northern part of the mainland is backed by a small bluff; the southern part of the mainland is diked.

Burgstaaken is a small harbor on Fehmarn and Grossenbrode Kai Ferry Harbor is located on the mainland.

Lübecker Bucht, a large bay about $14\frac{1}{4}$ miles long, is entered between Dahmeshöved and Gross Klütz Höved, about $11\frac{1}{2}$ miles south-southeastward. Neustädter Bucht occupies the head of this nearly rectangular bay. The Trave

River, in which are the ports of Travemünde and Lübeck, empties into the extreme southern part of the bay. There is a small inlet in the northern part of Neustädter Bucht in which lies the port of Neustadt. The fishing harbor of Niendorf lies on the southern side of the bay.

The northwestern shores of Lübecker Bucht are fairly low, but the southern shores are hilly and generally rise steeply from the sea. The western part of Neustädter Bucht is low and backed inland by a number of shallow lagoons.

Wismar Bucht is entered between Gross Klütz Höved and Kieler Ort, about $11\frac{3}{4}$ miles eastward. This irregularly shaped bay is interspersed with numerous dangers and the large island, Insel Poel, occupies the greater part of the eastern side of the bay. The port of Wismar lies on the southern side of the bay and is approached by a circuitous channel.

Fishery.—In Lübecker Bucht dredge net fishing is carried on annually from the beginning of December to the middle of April. Great care should be taken when navigating in the bay during thick weather.

DEPTHS AND DANGERS

5C-3 Except for Walkyrien Grund, all the dangers lie inside the 10-fathom curve, which trends very irregularly around this coastal indentation.

Off the western part of Mecklenburger Bucht between Staberhuk and Dahmeshöved, the 10-fathom curve lies up to 8 miles offshore. In Lübecker Bucht it lies up to $2\frac{1}{4}$ miles off the northwest and south coasts and up to about $4\frac{1}{2}$ miles off the southwest coast. It rounds Neustädter Bucht at distances up to 4 miles offshore.

Off Wismar Bucht and the coast northeastward to Buk Spitze, the 10-fathom curve continues its devious course and lies at its greatest distance offshore, nearly 8 miles, in the vicinity of Insel Poel.

The depths and dangers inshore of the 10-fathom curve are described with the related coastal features.

Walkyrien Grund, a shoal patch with a least depth of 6.7 m (21.9 ft.) and with foul ground nearby, lies in Lubecker Bucht in a position about 5 1/4 miles south-southwestward of Dahmeshoved.

A foul patch lies about 5 miles northwestward of Buk Spitze.

A triangular area closed to shipping, lying between Wismar Bucht and Buk Spitze, extends about 6 miles offshore.

WATER LEVEL

5C-4 Data on water fluctuations are given with the descriptions of the related ports.

ICE

5C-5 During severe winters, navigation is hindered to a greater extent in the inner parts of Lubecker Bucht and in Wismar Bucht than in the open sea area. However, as long as the bay areas are open to navigation, the river and bay ports are made accessible with icebreakers.

More details on ice are given with the description of the related ports and in table 6 in chapter 1.

WESTERN PART OF MECKLENBURGER BUCHT

5C-6 The small port of Burgstaaken is entered about 4 miles westward of Staberhuk and the port of Grossenbrode Kai Ferry Harbor is entered about 9 miles west-southwestward of the same point. The eastern entrance to Fehmarnsund lies between these two ports.

DEPTHS.—The 5-fathom curve lies up to about 1 3/4 miles off the coast of Fehmarn and the mainland except in the immediate approach to Fehmarnsund; here it lies up to 2 1/4 miles offshore. Sagas Bank, with a least depth of 8.2 m (26.9 ft.), lies from 2 to about 5 miles offshore about midway between Grossenbrode Kai Ferry Harbor and Dahmeshoved. Other than Sagas Bank there are no

dangers between the 5- and 10-fathom curves. Light buoys are moored 1 mile northward and 6 miles eastward, respectively, of Sagas Bank.

LANDMARKS.—On Fehmarn the church at Burg and the granary in Burgstaaken are conspicuous as are Grossenbrode Church and Dahmeshoved Lighthouse on the mainland.

BURGSTAAKEN (54° 25' N., 11° 12' E.) is a small port located at the northern end of a nearly closed shallow inlet. It is used by fishing vessels and local traffic. The entrance to the inlet is protected by two breakwaters. A buoyed channel dredged to a depth of 12 feet leads about 1 mile from the inlet entrance to the harbor; this channel is about 50 feet wide, but shoaling near the breakwaters restricts the fairway to a lesser width.

The variation of the water level is similar to that at Heiligenhafen (sec. 4D-8). The entrance channel freezes sooner than Fehmarnsund, but local traffic usually keeps it open until interrupted by ice forming in the Baltic Sea.

A light is shown on the head of the east breakwater. A pair of lights in range 316° are shown about 1 mile northwestward of the breakwater entrance and indicate the sea approach to the dredged channel. The entrance to the dredged channel is also indicated with a fairway buoy moored about 1/4 mile southeastward of the breakwaters. Range lights mark the fairway through the dredged channel.

A pilot is available. Special regulations for controlling traffic are in effect. Small vessels will find good anchorage during northerly winds in 2 3/4 to 3 3/4 fathoms near the fairway buoy in a position nearly 1/2 mile southeastward of the breakwaters.

The harbor, an artificial basin, is quayed and has depths of 3.7 m (12.1 ft.) alongside. The berths in the inner part of the harbor are served by the railroad. Water and a small quantity of fuel oil are available. There is a small shipyard. The customs office and harbor office are located in the harbor. The town of Burg lies nearly

1 mile inland and has a population of about 6,400 (1950).

FEHMARNSUND is described in sections 4D-2 and 4D-10.

GROSSEN BRODE KAI FERRY HARBOR (54° 21' N., 11° 05' E.) is an important rail and car ferry port serving Denmark and Sweden. It is of little importance for commercial vessels.

The harbor lies on the northeast side of a shallow inlet which is protected by a breakwater that fronts the entire entrance of the inlet. The harbor is approached from southward between the breakwater and the shore westward and thence through a channel dredged to a depth of 21 feet (1959) nearly alongside the breakwater.

A light is shown on the head of the breakwater. A fairway buoy, a lighted whistle buoy, is moored nearly 3/4 mile east-southeastward of the breakwater head.

The fairway in the dredged channel is marked with light buoys and buoys. The buoys on the east side of the channel carry yellow-white reflectors; those on the west side of the channel carry red reflectors. A pair of light beacons in range 333 1/2° stands on the northwest shore of the inlet and indicate the fairway in the entrance of the dredged channel. Two pairs of light beacons in range 007° and 010° are located in the harbor and indicate the fairway in the channel to the east and west ferry berths, respectively.

The lights of the three ranges marking the fairway in the dredged channel and the light and fog signal on the breakwater head are operated only when ferries are arriving or leaving.

In addition to the two ferry berths, there are two quays on the eastern side of the harbor. One of these quays has a berth about 500 feet long. Vessels with a draft of 12 feet can berth alongside the quays.

The harbor has customs service. Water and diesel oil are available.

A RADIOBEACON transmits from a position about 2 1/4 miles south-southwestward of the breakwater head at Grossenbrode Kai Ferry Harbor.

DAHME SHOVED LIGHT is shown on the point of the same name. A FOG SIGNAL is

sounded from a framework mast a short distance eastward of the light.

LUBECKER BUCHT

5C-7 NORTHWEST SIDE OF LUBECKER BUCHT.—The coast from Dahmeshoved to Pelzerhaken, a low point located about 10 1/2 miles southwestward, is low and sandy for the first 5 1/2 miles and thence becomes fairly high up to the vicinity of Pelzerhaken. Gromitz Church is the only prominent landmark; the church has a red steeple and is surrounded with poplar trees.

The 5-fathom curve lies less than 1 mile offshore except in the bight immediately southwestward of Dahmeshoved where it lies a little over 1 mile offshore.

A former ammunition dumping ground, rectangular in shape lies between about 2 1/4 and 4 3/4 miles eastward of Pelzerhaken. A dangerous area in which anchoring and fishing is prohibited lies adjacent to and southward of the southwest corner of the dumping ground.

SOUTH SIDE OF LUBECKER BUCHT.—The coast from Gross Klutz Hoved to the village of Rosenhagen, about 9 1/4 miles west-southwestward, is hilly and rises steeply from the sea in places. There are elevations of 100 feet and over near the shore and up to 300 feet a short distance inland. The prominent landmarks are the churches at Klutz, Elmenhorst, and Kalkhorst. Klutz is located about 3 miles southward of Gross Klutz Hoved. Elmenhorst and Kalkhorst lie about 3 1/4 and 5 1/2 miles, respectively, west-southwestward of Gross Klutz Hoved. Potentitz Castle, a very conspicuous white building, stands about 1 mile south-southwestward of Rosenhagen.

In general, the 5-fathom curve lies about 1/2 mile offshore, but off Klein Klutz Hoved, about 3 miles westward of Gross Klutz Hoved, it lies nearly 1 mile offshore.

The TRAVE RIVER and the PORTS OF TRAVEMÜNDE AND LUBECK are described in sections 5C-9 through 5C-12.

Neustädter Bucht is entered between Pelzerhaken and the high and steep land nearly 6 miles southward. It has general depths of 5 to 11½ fathoms outside the shorebank. The coast is alternately low and hilly, and there are wooded areas here and there. The church, water tower, and observatory tower at Neustadt and the tower at Elizabethbad, on the coast about 4½ miles west-southwestward of Pelzerhaken, are prominent. Gömnitz Berg, a 308-foot hill with a 39-foot tower on it, lies about 2½ miles westward of Neustadt and is a conspicuous landmark. On the south shore there is a prominent tower at Niendorf.

The shorebank as defined by the 5-fathom curve lies less than 1 mile offshore except in the approach to Neustadt harbor and off the southern entrance point. A buoy is moored on the edge of the shorebank southward of Pelzerhaken. In the approach to Neustadt harbor this shorebank lies up to 1¼ miles offshore and there are many rocks in the shoaler water near the shore. **Stein Riff**, which has foul ground and rocks over its inner part, is the shorebank that extends nearly 2½ miles northeastward from the southern entrance point of the bay. A **dumping ground** marked by a buoy lies on the outer end of this shoal area.

A former ammunition dumping ground is located in the western part of Neustädter Bucht.

There is a **tide gage** about ¼ mile westward of Pelzerhaken Light.

5C-8 Neustadt ($54^{\circ}06' N.$, $10^{\circ}49' E.$) is a river-type harbor that occupies the inner part of the small inlet in the northwestern part of Neustädter Bucht. This inlet is connected with an inland sheet of water. A channel with a least depth of 20 feet over a width of about 130 feet leads to the harbor from the outer bay.

Range lights, in range 347° , lead into Neustadt Harbor.

A pair of lights in range 347° is shown on the west side of the harbor entrance and indicates the fairway in the sea approach and outer part of the channel. Neustadt lighted

fairway buoy, is moored near the range line in the outer bay in a position nearly 2¼ miles southwestward of Pelzerhaken. A light is shown and a fog signal is sounded on a mole on the west side of the harbor entrance.

The channel is marked with **buoys and dolphins** and the various channel reaches in the harbor are indicated with **range lights**.

North-northeasterly winds raise the water level as much as 4 feet and south-southwesterly winds may lower it the same amount. As a rule the harbor freezes at the same time as Lübecker Bucht. Ice barriers form off the harbor with southeasterly winds. Winds from other directions drive the ice away from the Neustadt shores.

The harbor is quayed on the west side of the inlet and several short jetties project from the western shore. The outer and wider part of the inlet is the naval harbor; the inner part is the commercial harbor. The naval harbor has depths up to 25 feet and alongside the berths there are depths of 13 to 19½ feet. The commercial harbor has depths up to 16½ feet and a depth of 13 feet alongside the berth.

There is **anchorage** in 2¾ to 3¾ fathoms in the vicinity of the fairway buoy with Neustadt Church in line with the middle of the harbor entrance. There is anchorage farther out in 7 fathoms; the holding ground is good except during easterly winds.

Pilotage is not compulsory, but local knowledge is essential for entering. Pilots are available. Vessels arriving at night should make prior arrangements if a pilot is desired.

Facilities.—The town of Neustadt lies on both sides of the harbor and had a population of about 15,000 in 1958. In addition to being a seaside resort, it is engaged in the manufacture of metalware, concrete, and leather goods and in woodworking. The customhouse is on the east side of the inlet.

In the naval harbor, the main quay is 1,300 feet long and has depths of 13 to 18½ alongside. The outer jetty is 185 feet long and has depths of 13 to 20 feet alongside, but it is suitable only for small craft. The inner jetty has a berth for small vessels on the west side; it is 250 feet long and has a depth of 19½ feet alongside.

In the commercial harbor, the southern quay is 830 feet long and has a depth of 13 feet alongside. The two northern berths along the quay are 500 and 185 feet in length and have a depth of 13 feet alongside. On the east side of the harbor there is a fish quay that is 500 feet long and has a depth of 13 feet alongside.

Water, fuel oil, and provisions are obtainable. The railroad serves the quay on the west side of the inlet. There are no tugs or lighters.

NIENDORF FISHING HARBOR lies on the south side of Neustadter Bucht. It consists of a small basin with an entrance, about 50 feet wide, facing west-northwestward. A breakwater extends about 200 yards northwestward from the outer part of the harbor and gives added protection to the basin. A light is shown on the head of the breakwater. A pair of light beacons stands on the north side of the entrance to the basin and in range 108° indicate the harbor approach.

TRAVEMUNDE AND APPROACHES

Position: 53°58'N., 10°53'E.

Depths: Approaches, 9.2 to 20.1 m (5.0 to 11.0 fm).

Anchorage, 12.8 to 20.1 m (7.0 to 11.0 fm).

Approach channel, 10.0 m (32.8 ft.)

Harbor, 3.3 to 10.0 m (10.8 to 32.8 ft.).

Berths, 3.3 to 10.0 m (10.8 to 32.8 ft.).

Tides: Negligible.

5C-9 The port of Travemunde occupies the entrance of the Trave River and has berthing facilities on both sides of the river.

WATER LEVEL.—Northerly to east-southeasterly winds raise the water level and westerly to south-southwesterly winds may lower it. In extreme cases the water may rise as much as 10 3/4 feet and fall as much as 6 1/2 feet below mean sea level. Fluctuations up to 3 feet above or below mean sea level occur several times a year.

CURRENTS.—North-northwesterly through northerly to easterly winds generally set up an incoming current and winds from a westerly to southerly direction set up an outgoing

current. Immediately outside the entrance, the incoming current sets southwestward in midchannel and on the southeastern side of the channel; on the northwest side of the channel it sets southward immediately in front of the north mole.

The outgoing current divides into two arms at the river entrance; one arm follows the direction of the channel as far as the roadstead; the other arm sets southward toward the Mecklenburg coast. The currents sometimes attain a rate of 4 knots.

Inside the moles the currents follow the direction of the river, but are deflected northward by the curve in the harbor. Close inshore there is often a countercurrent which may attain half the rate of the current in the middle of the river.

ICE.—Icebreakers normally keep the Trave River open to navigation as far as Lubeck, but when Lubecker Bucht is closed by ice, all navigation on the Trave River is stopped. Icebreakers are used on the average of about 12 days a year. During severe winters, icebreakers may be used up to 59 days and during mild winters, navigation continues without interruption.

Table 6 in chapter 1 gives data on ice formation and disappearance.

The thickness of ice varies from about 2 to 16 inches.

DEPTHS.—The dredged approach channel leading to the river entrance has a depth of 33 feet. Northeasterly gales sometimes cause shoaling in the dredged channel.

In the anchorage there are depths of 7 to 11 fathoms.

The harbor has depths of 3.3 to 10.0 m (10.8 to 32.8 ft.); the dredged channel through the harbor has a depth of 10.0 m (32.8 ft.) as far as Skandinavienkai, thence 9.5 m (31.1 ft.) as far as Siems.

FISHERY.—From the middle of December to the beginning of May the limits of a fishing ground in the approach to Travemunde, about 2 1/2 miles northeastward of the river entrance, are marked by two BUOYS.

APPROACHES.—The harbor is approached between Stein Riff (sec. 5C-7) and the shorebank on the southern side of Lubecker Bucht. The eastern side of Stein Riff is marked by a buoy, painted in red and white bands.

A DANGEROUS AREA, rectangular in shape and in which wrecks are dumped, lies on the eastern side of the approach with its western end about 1 1/2 miles northeastward of the river mouth.

TRAVEMUNDE LIGHT is shown on the north side of the river mouth. A RADIO-BEACON transmits from the light station. A light, from which a fog signal is sounded, is shown from the head of the northern mole.

A pair of LIGHT BEACONS in range 216° stand on the south side of the river mouth and indicate the fairway from the approach to the river mouth. The dredged entrance channel is marked by buoys.

SUBMARINE CABLES are laid across the river near the harbor entrance and in the vicinity of ferry crossings. The landing places are marked by notice boards.

HARBOR.—The harbor comprises about 1 mile of the river mouth. It consists of several small piers and a quay on the north side of the river and two small landing piers in a basin on the south side of the harbor. A fish harbor and a yacht harbor are located at the southwestern end of the north side of the harbor. There are a number of DOLPHINS and two MOORING BUOYS in the harbor.

The fairway in the dredged channel is indicated with several pairs of RANGE LIGHTS. The channel is also marked with LIGHTED PILES and a LIGHT BUOY.

STORM SIGNALS are displayed close eastward of Travemunde Light.

A motor lifeboat and line-throwing equipment are maintained at Travemunde.

Customs signals are displayed from a white mast about 1/2 mile west-southwestward of Travemunde Light.

A TIDE GAGE stands close northeastward of the main quay.

There is ANCHORAGE in 7 to 11 fathoms about 3 miles northeastward of the harbor entrance and clear of the dangerous area, with Travemunde Light bearing 237° and Potentitz Castle bearing 206°. Even though a choppy sea is set up during northeasterly winds, a well-anchored vessel should be able to ride out a gale from this direction. There is also anchorage in 9 fathoms in the northwestern part of the roadstead in a position about 2 1/2 miles north-northeastward of Travemunde Light.

PILOTAGE is compulsory for merchant vessels. The pilot station is located on the north side of the harbor a short distance within the river mouth. A lookout is maintained and signals are shown from the signal mast eastward of Travemunde Light. Pilots come out in motor boats and will board by day or night in the vicinity of the fairway buoys.

If weather conditions prevent a pilot from boarding a vessel requiring a pilot, the pilot boat will display by day a red flag at the masthead, or at night douse the red and white lights prescribed for pilot vessels, and will proceed ahead of the vessel, which should follow in her wake. The pilot will board the vessel inside the north mole.

If a strong gale prevents the departure of the pilot boat from the pilot station the International Code signal indicating the pilot boat is unable to leave the harbor will be shown at the signal mast by day and a red light will be shown on each end of the signal yard at night; at this time it is permissible for vessels to enter without a pilot.

DIRECTIONS.—Vessels approaching from the northeast will probably see the high pyramidal towers at Lubeck when near Wal-kyrien Grund, but when closer in these towers will disappear behind the high intervening land. Next to come into sight will be the

slender tower of Travemunde Church and the water tower, followed by the large buildings of Kurhaus, on the north side of the entrance, and the light beacons of the entrance range. On the east side of the harbor, Elmenhorst Church, Potenitz Castle, and Volksdorfer Mill, located about 1 mile southwestward of the castle are conspicuous.

When the light beacons of the entrance range (216°) are definitely identified and are in range, vessels should steer in on them, which leads to the harbor entrance.

With an onshore gale, vessels are advised to enter with sufficient steerageway so that when the pilot is picked up inside the moles the steering capacity is not lost. Both anchors should be in readiness for dropping.

5C-10 TRAVEMUNDE, in addition to being an outer suburb of Lubeck and a popular seaside resort, is an outport for Lubeck. It is also a fishing harbor. The harbor has landing facilities for passenger vessels. The customs and port authorities are stationed here. There is a population of about 14,000.

Ostpreussen Kai, the principal berth, lies on the north side of the river; it is about 625 feet long and has depths of 10.0 m (32.8 ft.). Skandinavienkai, a saw-tooth quay farther upstream, is about 1,700 feet long and has depths of 7.5 to 7.9 m (24.6 to 25.9 ft.) alongside. The basin on Priwall, on the south side of the river, has depths of 3.3 to 4.5 m (10.8 to 14.7 ft.). Numerous piers and pilings serve to accommodate small craft. A coal quay, close southwestward of the basin, has depths of 6.0 to 6.5 m (19.6 to 21.3 ft.) alongside.

Provisions, water, and fuel oil are available. Fuel oil can be supplied in a barge. Tugs, also used as icebreakers, are available. A salvage tug with diving equipment is stationed in Travemunde.

There are two floating drydocks, the larger having a capacity of 500 tons, and a number of small marine railways. Minor repairs can be effected. A crane with a capacity of 25 tons is available.

The town has railroad communications with the general system via Lubeck.

TRAVEMUNDE TO LUBECK

5C-11 Lubeck is located about 10 miles up the Trave River from Travemunde. The channel leading to Lubeck is dredged to a least depth of 8.5 m (27.8 ft.). Buoys, light

buoys, lighted poles, and, in some places, dolphins mark the channel. The two reaches of the channel immediately southward of Travemunde are indicated by lighted ranges.

There are harbor installations at Schlutup, on the south side of the river about midway between Travemunde and Lubeck; at Herrenwyk, on the north side of the river opposite Schlutup; and at Siems, about 1 1/4 miles farther up the river.

The only anchorage in the Trave River is at Grosse Holzwiek, about 3 miles from Travemunde. There is additional anchorage in Potenitzer Wiek for small vessels.

An overhead cable with a vertical clearance of 163 feet spans the river at Schlutup, another overhead cable, with a 163-foot vertical clearance, crosses the river about 2 1/2 miles upstream from Schlutup.

REGULATIONS.—The speed of vessels must not exceed 9 knots between Travemunde and Schlutup and must not exceed 6 1/2 knots between Schlutup and Teerhof Insel, about 3 miles farther up the river. Vessels must proceed to the harbor of Lubeck at a slow speed.

The assistance of two tugs is compulsory between Stulper Huk, about 2 miles southward of Travemunde, and Lubeck for the vessels of about 1,400 net tons or of a draft of 19 1/2 feet and greater.

POTENITZER WIEK, a shallow bay southward of Priwall, has general depths of 16 1/2 to 28 1/2 feet in a pool in its central part. A channel with a least depth of 4.1 m (13.4 ft.) and marked by buoys leads from the river channel a short distance southward of the southern end of Priwall into the bay. There is anchorage for vessels able to transit the entrance channel; the holding ground is fair.

Dassower See, another shallow bay, is entered from the southern side of Potenitzer Wiek.

HERRENWYK.—At Herrenwyk there is a basin at the smelting works that has on its northeast side a berth about 1,500 feet long with a depth of 7.9 m (25.9 ft.) alongside. A row of dolphins stands on the southwest side of the basin. The berth is served by the railroad. The channel from Travemunde to the entrance of this basin is dredged to a depth of 9.5 m (31.1 ft.).

SCHLUTUP.—On the northwest side of Schlutup there is an open basin with a berth about 2,700 feet long, fitted with cranes, and with depths of 6.2 to 6.3 m (20.3 to 20.6 ft.) alongside. Buoys and dolphins lie on the northwest side of this basin. A channel with a least depth of 3.4 m (11.1 ft.) and marked with buoys leads southwestward from this basin to the power plant berth; the latter is about 400 feet long and has a depth of 12 feet alongside.

On the southeast side of Schlutup there is a small fish harbor.

The channel in the vicinity of Schlutup has a depth of 9.5 m (31.1 ft.).

FLENDERWERKE SHIPYARD lies on the north side of the river between Schlutup and the bridge. There are extensive facilities for ship repair at this yard. The largest crane has a lifting capacity of 75 tons.

BRIDGE—BRIDGE SIGNALS.—A double bascule bridge, with a horizontal clearance of 203 feet, crosses the river at Siems; a vertical clearance of 74 feet is available when the bascule span is closed.

The signal to open the bridge is two long blasts when at least 1/3 mile from the bridge.

The following signals will be exhibited on the western bank of the river, at the entrance to the cut above and below the bridge.

(a) Three white lights, disposed horizontally: Bridge closed; vessel should repeat the signal to open the bridge, and await further signal.

(b) Two white lights, disposed horizontally: Bridge closed; vessel should repeat the signal to open the bridge, and await further signal.

(b) Two white occulting lights, disposed horizontally: Signal heard and understood; vessel should await further signal.

(c) Two white equal interval lights, disposed horizontally: Vessel may enter the cut. In low visibility the following sound signals will be made, additional to (c) above:

(i) Two short blasts followed by one long blast:

A vessel bound down river may enter the cut.

(ii) One short blast followed by two long blasts: A vessel bound up river may enter the cut.

The following signals will be exhibited on the western pier of the bridge, and are to be observed by all vessels:

(a) Two red lights, disposed horizontally, with one white light above them; Passage prohibited except for a vessel which can pass under the bridge in its closed position.

(b) Two red light, disposed horizontally: Passage prohibited to all vessels.

(c) Two green lights, disposed horizontally, and, in low visibility, two long blasts, one short blast and one long blast; Passage clear.

(d) Three red lights, disposed horizontally, and, in low visibility, four short blasts: Passage prohibited; bridge cannot be opened for the time being.

(e) Three red lights, disposed horizontally, with one white light above them, and, in low visibility, four short blasts: Bridge cannot be opened for the time being; passage permitted only for vessels which can pass under the bridge in its closed position.

(f) Two red lights, disposed vertically, and, in low visibility, three long blasts repeated twice: No traffic through the bridge; passage prohibited to all vessels.

Vessels must not exceed a speed of 4 knots when passing through the bridge.

SIEMS.—At Siems, the berth at the power plant is about 650 feet long and has depths of 7.5 to 9.5 m (24.6 to 31.1 ft.) alongside. The depth from Travemünde to Siems is 9.5 m (31.1 ft.).

DANISCHBURG lies on the north side of the river about 1 mile above Siems. The approach to the berth in this harbor has a depth of about 4.1 m (13.4 ft.) and is marked with buoys.

LUBECK

Position: 53°53'N., 10°42'E.

Depths: River Channel, 8.5 m (27.8 ft.).
Petroleum Hafen, 3.9 to 5.5 m (12.7 to 18.0 ft.).
Outer harbors, 3.0 to 10.0 m (9.8 to 32.8 ft.).
Inner harbors, 1.5 to 3.5 m (4.9 to 11.4 ft.).

Port plan: See "Facilities."

5C-12 The port of Lubeck comprises that part of the Trave River that lies between Teerhof Insel and the Elbe-Trave Kanal. It is divided into two parts, each of which has a number of basins known as harbors. The outer part is for seagoing vessels and the inner part is primarily for barge traffic.

Vessels up to 490 feet in length and drawing not more than 26 feet can reach Lubeck.

The OUTER PART consists of the following:

Petroleum Hafen, on the southwestern side of Teerhof Insel, has several small piers and two dolphins.

Vorwerker Industrie Hafen, entered close southward of Teerhof Insel, is a narrow basin about 1/2 mile long. This basin has a quayed berth on the west side and there are three dolphins.

Umschlag Hafen is that part of the river that lies eastward of Vorwerker Industrie Hafen. It is about 1 mile long; it is quayed and has wharves in several places. In the middle of the harbor there is a turning basin; in this vicinity there are a number of dolphins

and a floating drydock. A tide gage is located on the east side of the river a short distance southward of the entrance to this harbor.

Burgtor Hafen lies immediately southward of Umschlag Hafen; it is quayed on both sides.

Wall Hafen and Hansa Hafen are quayed basins entered from Burgtor Hafen. A tide gauge is located in the entrance to Hansa Hafen.

Holsten Hafen is entered from Hansa Hafen. A swing bridge, with a horizontal clearance of 41 feet, separates the two basins, vessels are limited to a length of 200 feet and a beam of 36 feet.

The inner part of the harbor consists of Klug Hafen, which is entered from the eastern end of Hansa Hafen and which leads to St. Jürgens Hafen; Obere Trave, which is entered at the southern end of Holsten Hafen; and Stadtgraben, which is entered at the inner end of Wall Hafen. There are depths of 5 to 11½ feet in these basins and the shores are quayed. Bridges that open for barge traffic span the entrances to these basins and cross the waterway in several other places. All these basins lead to the Elbe-Trave Kanal.

FACILITIES.—Lubeck is Germany's leading Baltic Sea port and also the northern terminus of the Elbe-Trave Kanal. The population, including suburbs and Travemünde, is about 240,000 (1966). The main part of the city lies on an island that is surrounded by basins or waterways of the inner harbor that lead to the Elbe-Trave Kanal.

In addition to being an important port and serving the inland waterways, Lübeck is also an industrial center. The principal industries are shipbuilding and repairs, foundries, manufacture of machinery and oxygen and electrical instruments, textiles, enamelware, and canning fish. The main exports are pig iron, coal, machinery, fertilizer, porcelain, and glass. The principal imports are wood, grain, phosphates, and iron and copper ores.

Berths.—Petroleum Hafen has about 3,600 feet of berthage with depths of 9¼ to 16½ feet alongside. Petroleum products and inflammables are handled here.

Vorwerker Industrie Hafen has a bering length of 2,500 feet with 7.5 to 8.4 m (24.6 to 27.5 ft.) alongside. There are two granaries here that are equipped with grain elevators.

Umschlag Hafen is quayed in some places and has several wharves where lighters and small vessels secure. There are dolphins in this harbor where vessels can moor and discharge into lighters. It has 2,200 feet of berthing space on the western side with 5.0 to 8.5 m (16.4 to 27.8 ft.) alongside. Konstin Kai, on the eastern side, is about 1 mile long and extends upstream into Burgtor Hafen with depths of 7.4 to 10.0 m (24.2 to 32.8 ft.) alongside..

Burgtor Hafen has 1,400 feet of berthing space on the western side of the river with depths of less than 8.0 m (26.2 ft.) alongside.

Wall Hafen has on its northwest side Roddenkoppel Kai which is about 1,750 feet long and has depths of 7.2 to 8.4 m (23.6 to 27.5 ft.) alongside. Kühlenkamp Kai, on the southeast side of the harbor, is about 2,200 feet long and has depths of 6.8 to 7.6 m (22.3 to 24.9 ft.) alongside.

Hansa Hafen has on its northwest side Behn Kai, which is about 1,750 feet long and has depths of 6.7 to 7.5 m (21.9 to 24.6 ft.) alongside. Town Quay lies on the southeast side of the harbor and has depths of 6.4 to 7.2 m (20.9 to 23.6 ft.) alongside.

Holsten Hafen has about 2,100 feet of quayage on the eastern side with 3.0 to 6.0 m (9.8 to 19.6 ft.) alongside. There are piles on the western side at the northern and southern ends of the basin.

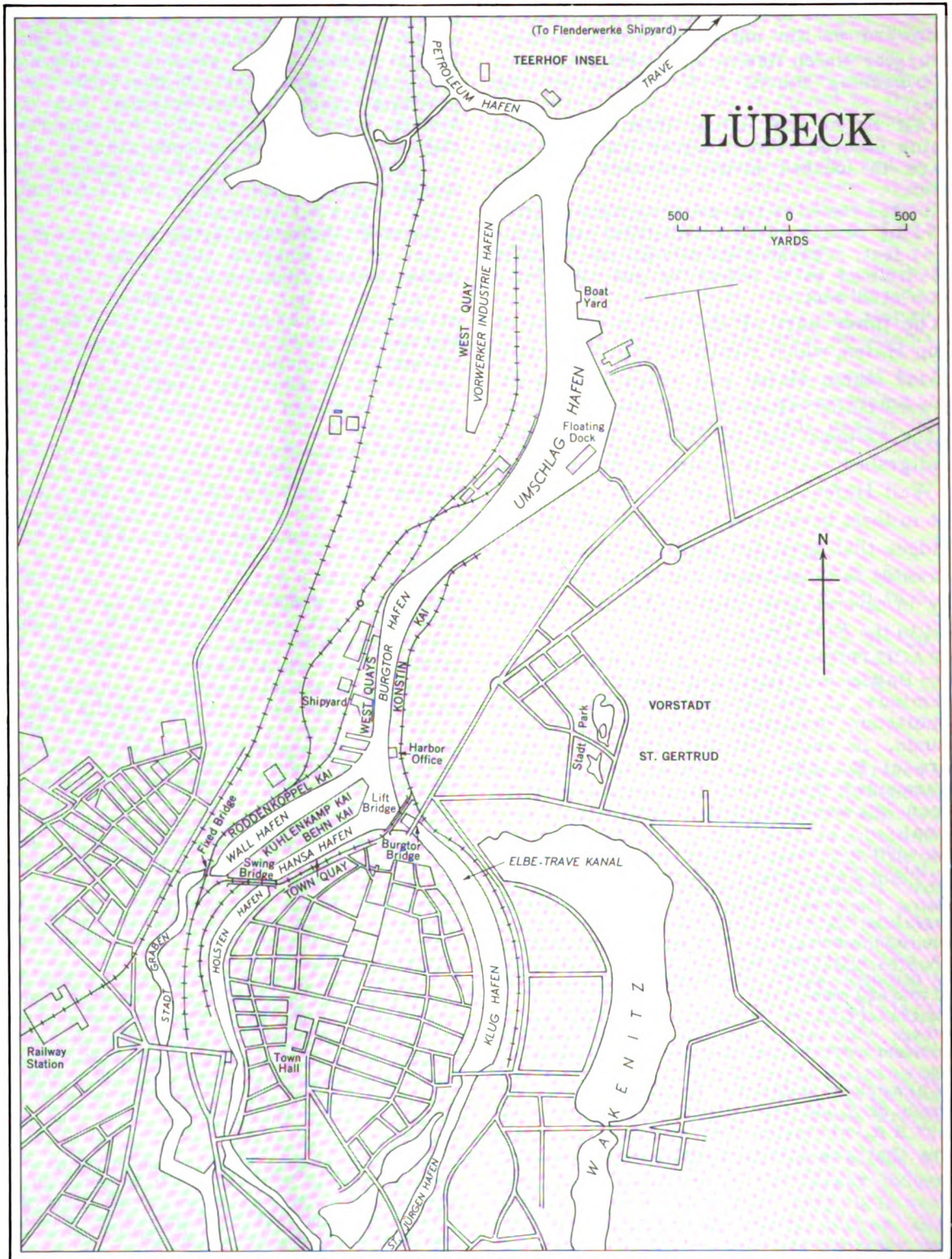
The main berths are served by the railroad and are equipped with cranes varying in capacity from 1½ to 10 tons. There is a 40-ton fixed crane in Hansa Hafen. At the northern end of Konstin Kai there are two 5-ton bridge transporters with grabs. Two floating cranes, with capacities of 60 and 75 tons, are in the harbor.

Tugs and lighters, some with a capacity of 200 tons, are available. Two water barges with a capacity of 25 tons each and seven oil barges, the largest with a capacity of 70 tons, are also available.

Supplies.—Ship's stores, provisions, and coal are procurable. Water is laid at all berths and diesel oil and fuel oil are obtainable. Oil and water can be delivered by barges.

Repairs.—In addition to the shipyard in Lübeck there is Flenderwerke Shipyard. Major and minor repairs can be made. There are several marine railways and floating drydocks. The largest drydock has a lifting capacity of 7,500 tons and can accommodate a vessel 540 feet in length and 68 feet in breadth. There is a graving dock 1,115 feet long and 130 feet wide. The salvage vessel at Travemünde has divers and diving equipment.

Communications.—Lübeck has regular steamer service with various Baltic ports. It is also connected with the whole German waterway system through the Elbe-Trave Kanal. The railroad is part of the general railroad system in the country.



Medical.—The city has modern medical facilities and hospital accommodations.

Deratting.—See section 1-7.

ELBE-TRAVE KANAL

5C-13 The Elbe-Trave Kanal leads southward from Lübeck and connects with the Elbe River at Lauenburg, a distance of 41½ miles. This canal is navigable by vessels up to 1,200 tons, with a length not exceeding 260 feet, a beam of 38 feet, and a draft of 6½ feet. There are seven locks, each 262 feet in length, and 39 to 56 feet in width. The bridges over the canal have a vertical clearance of 14 feet and a width of 89 feet. The bottom of the canal is 65 to 72 feet wide; the sharpest curve is about 650 yards in radius.

WISMAR BUCHT AND WISMAR

Position: 53°54'N., 11°28'E.

Depths: Sea approaches, over 18.2 m (10.0 fm).

Grosses Tief, 10.0 to 19.0 m (32.8 to 62.3 ft.).

Offen Tief, 5.0 to 5.9 m (16.4 to 19.3 ft.).

Dredged channel, 8.6 m (28.2 ft.).

Harbor, 5.7 to 9.7 m (18.7 to 31.8 ft.).

Tides: Negligible.

5C-14 Wismar Bucht is the coastal indentation between Gross Klütz Höved and Kieler Ort (54°03' N., 11°31' E.), about 11¾ miles eastward. Kieler Ort is the low southwestern extremity of Halbinsel Wustrow, an irregularly formed peninsula.

The bay is further divided into several smaller and well-defined bays, the southernmost of which has the port of Wismar in its inner reaches. Insel Poel, which is fairly large, lies on the extensive shorebank that occupies most of the eastern part of the bay; it is connected with the mainland by a causeway.

In addition to the above-mentioned shorebank, the bay is encumbered by a large shoal bank that extends northeastward across the bay from the western side of the bay. In the intervening waters there are several shoal banks.

Boltenhagen Bucht and Wohlenberger Wiek, the two western bays, are fairly clear of

dangers and have regular depths. The southernmost bay in Wismar Bucht and the inlet eastward of Halbinsel Wustrow are shallow throughout. Access to the port of Wismar is made through a dredged channel.

There are two entrance channels. Grosses Tief, the deeper and main channel, is entered from the eastern side of the bay northward of the eastern end of Insel Poel. Offen Tief, the other channel, leads over the narrowest part of the shoal bank extending from the western side of the bay. Inside the bay the channel to the port of Wismar is intricate but well marked with navigational aids.

Ice.—In general, the ice conditions in Wismar Bucht are about the same as in other parts of Lübecker Bucht. However, the fairway to Wismar, being relatively shallow and having little current, is more subject to ice formation than the nearby ports on the open sea. The channel to the port is kept open by harbor tugs.

See table 6 in chapter 1 for additional information.

Water level.—Winds from a northerly to easterly direction raise the water level and winds from a southerly to westerly direction lower the water level. Fluctuations between about 2½ feet above the mean level to about 1½ feet below the mean level occur frequently. In rare instances the water level was recorded to have risen as much as 9 feet and fallen as much as 6 feet below the mean level.

Currents.—Currents are caused by the winds and are normally slight, being noticeable only in the deep water during continuous winds. With northerly and easterly winds the current sets westward in the part of the bay northward of Insel Poel and southward in that part of the bay westward of the island. With southerly and westerly winds the current sets in the reverse direction.

Depths.—Grosses Tief has depths of over 5 fathoms as far as Kraken Tief. Offen Tief has depths of 5.0 to 5.9 m (16.4 to 19.3 ft.) as far as Kraken Tief. From Kraken Tief to the dredged channel leading to Wismar there are depths greater than 5 fathoms. In the dredged channel there is a least charted depth of 8.6 m (28.2 ft.) (1967).

Boltenhagen Bucht has depths of 5 to 10 fathoms outside the shorebanks. Wohlenberger Wiek has general depths of 3 to 5½ fathoms.

The outer roadstead has depths of 3 to 5½ fathoms between the shorebanks. The inner roadstead has depths of 3 to nearly 5 fathoms outside the dredged channel and between the shorebanks.

There are general depths of 5.0 to 9.0 m (16.4 to 29.5 ft.) in the harbor and alongside the larger berths. It was reported (1967) that ships with a draft of 27 feet can safely enter the harbor.

The depths in the harbor and channel are subject to frequent changes and dredging is necessary to maintain the depths.

5C-15 Aspect and landmarks.—The western shore of Boltenhagen Bucht is fairly steep, and the land in Wohlenberger Wiek is moderately high. Insel Poel is low on its western side and has few trees. The land rises to an elevation of 89 feet in the middle of the island.

The long and narrow Kieler Ort is low, but the northwest coast of Halbinsel Wustrow is moderately steep and rises to an elevation of 69 feet in its northern part; a short distance farther northward is a narrow sandy isthmus that connects the peninsula with the mainland.

On the west side of Wismar Bucht, Klützig Church (sec. 5C-7) and Hohenkirchen Church, about 5¾ miles southeastward, are prominent.

On Insel Poel the following are prominent: Timmendorf Lighthouse; Kirchdorf Church, in the village of Kirchdorf nearly in the middle of the island; and the flagstaff of the Kurhaus, located about 1¼ miles northward of the church. Two towers, part of a radar station, are located about 1 mile northeastward of

Timmendorf Lighthouse. An observation post and a signal mast stand on one of the towers. There is a life-saving station close by Timmendorf Lighthouse. A motor lifeboat is maintained.

On the east side of the bay the following are conspicuous: Buk Lighthouse (sec. 5D-1); Rerik Church, located in the village of Rerik at the inner end of the sandy isthmus mentioned above; and Stove Mill and Dreveskirchen Church, located about 6½ and 7 miles south-southwestward of Rerik Church and both visible over Insel Poel. Dreveskirchen Church is red and has a steeple.

Navigational aids.—Timmendorf Light is shown on the western side of Insel Poel. Occasionally a fog signal is sounded nearby. Storm signals are shown at the signal station close westward of the lighthouse.

Golwitz Light and a pair of range lights are shown at Golwitz, on the northern end of Insel Poel. Occasionally, a fog signal is sounded nearby.

Lights are shown at Tarnewitz, located between Boltenhagen Bucht and Wohlenberger Wiek; at Hohen Wieschendorf Huk, the eastern entrance point of the latter bay; and in various places in the southernmost bay of Wismar Bucht and the harbor.

The main channel to the harbor is marked with buoys and light buoys. Southward of Kraken Tief the channel fairway is further indicated by ranges formed by lights and beacons; details of these ranges are given in the appropriate places.

Outer dangers.—From the peninsula that separates Boltenhagen Bucht from Wohlenberger Wiek, an extensive shoal area with depths of less than 6 fathoms extends across the entrance of Wismar Bucht and nearly joins with the shorebank extending from Halbinsel Wustrow. Lieps is the southwestern part of these shoals; on it are some rocks and a drying patch. Hannibal is the northeastern or outer part of these shoals. A neck about 1 mile long and with depths of 4.5 to 5.9 m (14.7 to 19.3 ft.) connects these shoal areas.

A cardinal north buoy, "Hannibal N", is moored on the northern side of Hannibal in a depth of about $5\frac{1}{4}$ fathoms, about 5 miles northward of Timmendorf Light. Buoys are also moored on the northeast end and south side of Hannibal in the vicinity of the fairway of Grosses Tief.

Rerik Riff, on which there is foul ground, extends nearly $1\frac{1}{2}$ miles westward from the southern end of Halbinsel Wustrow to the 3-fathom curve; the 6-fathom curve lies somewhat farther offshore.

Entrance channels.—Grosses Tief, with depths of 10.0 to 19.0 m (32.8 to 62.3 ft.), is entered about $3\frac{1}{2}$ miles northwestward of Kieler Ort. It leads southward between the 6-fathom curves defining Hannibal and Rerik Riff and thence southwestward between Hannibal and the shorebank extending from Insel Poel. At a position about $1\frac{3}{4}$ miles northward of Timmendorf Lighthouse, this channel leads westward over its shallowest part into Kraken Tief, the pool between Lieps and Hannibal.

The approach to and the first reach of Grosses Tief are indicated by a pair of **light beacons** in range 165° located at Golwitz. The channel entrance is marked by a **lighted whistle buoy** with a radar reflector moored nearly $3\frac{1}{2}$ miles north-northwestward of Golwitz Lighthouse and by an unlighted buoy moored nearly $\frac{1}{2}$ mile south-southwestward of the light buoy. The remainder of the channel is marked adequately by additional **buoys and light buoys**.

Flagg Tief, a narrow channel with depths of 4.5 to 5.7 m (14.7 to 18.7 ft.), leads from Grosses Tief in a position about $1\frac{1}{2}$ miles northward of Timmendorf Lighthouse to pass over the shoals lying within about $1\frac{1}{2}$ miles of the northwest end of Insel Poel. This channel is suitable for small vessels with local knowledge. A light buoy and three buoy marks the fairway of this channel. Another buoy is moored in about 3 fathoms on the western side of the subject shoals.

Offen Tief, with depths of 5.0 to 5.9 m (16.4 to 19.3 ft.), leads into Kraken Tief over the narrow shoal neck that connects Lieps with Hannibal.

Offen Tief is closed to shipping and is not buoyed (1961).

A dangerous wreck, marked by a buoy, lies about $3\frac{1}{2}$ miles northwestward of Insel Poel.

5C-16 Inner channel.—From Kraken Tief to Wismar harbor, the channel consists of **four reaches**. These are described from north to south as follows.

The **first reach** leads southward from Kraken Tief into the outer roadstead. It passes between the shoal patches of Schweinsköthel and Sechers Grund, on the west, and Mittel Grund, on the east; these patches have least depths of 3.7, 4.3 and 4.7 m (12.1, 14.1 and 15.4 ft.), respectively.

The fairway in this reach is indicated by the pair of **lights** on Hohen Wieschendorf Huk in range $180\frac{1}{3}^\circ$ and by the **light buoys** on both sides of the channel. A **buoy** is moored on the eastern side of Schweinsköthel and another is moored on the southern side of Mittel Grund.

The **second reach** leads southeastward from a position nearly $1\frac{1}{4}$ miles northward of Hohen Wieschendorf Huk through the outer and inner roadsteads to a position about $\frac{1}{2}$ mile northwestward of Walfisch.

Walfisch Light Beacon stands on the islet of the same name in the harbor approach of Wismar.

The fairway is indicated by **Walfisch Light Beacon** in range 124° with **Poel-Walfisch Light Beacon**, located about $\frac{1}{2}$ mile northwestward, and is marked by **buoys and light buoys**.

The dredged channel is entered at **Light Buoy No. 7** and continues to the harbor. It

has a least charted depth of 8.6 m (28.2 ft.) (1967) over a bottom width of 130 feet, being somewhat wider at the turns in the channel.

The **third and fourth reaches** lead from the vicinity of Walfisch in a general south-southeasterly direction to the harbor. Buoys are moored on both sides of the channel in these reaches. The fairway of the outer reach is indicated by **Wendorf Light Beacons** in range $159\frac{1}{2}^{\circ}$, ahead, and **Poel-Walfisch Light Beacon** in range $339\frac{1}{2}^{\circ}$ with **Poel Light Beacon**, astern; **West Beacon** is the third mark on the latter alinement.

Wendorf front light beacon stands on the western side of the channel about 1 mile southward of Walfisch; the rear light beacon stands on the shore close northwestward of the harbor entrance.

Poel Light Beacon stands on the south side of Insel Poel about $1\frac{1}{2}$ miles north-northwestward of Walfisch.

West Beacon, a 26-foot framework structure with a cross topmark, stands on Insel Poel in a position about $1\frac{1}{4}$ miles north-northwestward of Poel Light Beacon. Another beacon stands about $\frac{1}{4}$ mile northeastward of West Beacon.

The fairway in the inner reach is indicated by **Wismar Light Beacons** in range 150° , ahead, and **Fliemsdorf Light Beacons** in range 330° , astern.

Wismar Light Beacons stand on the west-ern side of Wismar harbor. Fliemsdorf Light Beacons stand on the west side of the channel of the outer reach.

Wohlenberger Wiek, with depths of 6.5 to 9.5 m (3.5 to 5.1 fm), is a sheltered bay that affords good anchorage, mud bottom, everywhere outside the shorebank. The shorebank

as defined by the 3-fathom curve is less than $1\frac{1}{2}$ mile wide, but rocky ground extends about $\frac{3}{4}$ mile northward from Hohen Wieschendorf Huk. Tarnewitz is a small harbor, closed to general navigation, located in the northwestern part of the bay.

Roadsteads—Anchorages—Lighted buoys.—The outer roadstead lies on the northwestern side of the fairway between Hannibal and Insel Poel. The inner roadstead lies between the western side of Insel Poel and Mittel Grund.

Vessels anchor in the outer roadstead in 11.0 to 13.9 m (6.0 to 7.6 fm), sand. Vessels anchor in the inner roadstead in 8.0 to 9.0 m (4.3 to 4.9 fm), sand and mud, and clear of a measured distance area lying close off the southwestern side of Insel Poel.

A lighted buoy is moored about $\frac{1}{4}$ mile southwestward of the harbor at Timmendorf Light.

Kirch See is a narrow, shallow inlet that extends about 2 miles inland from the southern side of Insel Poel. A channel marked by buoys and lighted ranges leads to the village of Kirchdorf at the head of the inlet.

5C-17. Harbor.—The harbor consists of a turning area immediately within the entrance and four artificial basins, each of which is entered from the turning area. The basins are named from north to south as follows: Kalihafen, Ueberseehafen, Alter Hafen, and Werfthafen. On the north side of the harbor entrance there is an oil berth. On the south side of the harbor entrance there is a large shipyard.

Almost the entire harbor is lined with quays and wharves. There are general depths of $18\frac{1}{4}$ to $31\frac{1}{4}$ feet in the harbor and alongside the berths in the basins; these depths are maintained by dredging.

The inner end of Ueberseehafen is a yacht harbor, and the inner part of Alter Hafen is a fishing harbor. Most of Werfthafen is used as a fitting-out basin by the shipyard.

The inner end of the dredged channel leading into the turning basin is marked on its sides by **lighted piles** and **buoys**. A shoal area with a small islet on it extends from the mole between Kalihafen and Ueberseehafen; several **buoys** mark the outer edge of the shoal. **Lights** are shown in several places in the harbor.

Storm signals consisting of a ball only are shown from a mast that stands on the eastern side of the entrance to Alter Hafen.

Regulations.—The pilot captain is the authority that decides the maximum draft allowable in the fairway.

The maximum speed in the fairway southward of Light Buoy No. 9 is 8 knots.

Tug assistance is compulsory for vessels over 400 gross tons and 229 feet in length.

Pilotage.—Pilotage is compulsory. Pilots are stationed in a small harbor close westward of Timmendorf Lighthouse and in Wismar harbor. Pilots are available day and night. They will pilot vessels from sea to the anchorage or to the harbor. Vessels, exceeding 4,000 tons D.W., arriving after sunset anchor overnight in the inner roads and proceed to the port during daylight. Vessels of less than 4,000 tons D.W. may enter the port day or night.

Pilots board vessels from a motor boat with a cutter rig off the entrance to Grosses Tief. Mariners are advised not to enter the channel but to wait for the pilot outside the channel as the fairway is very narrow in the first reach of Grosses Tief.

If Timmendorf pilots are unable to come out, they will indicate so by International Code signal from the signal station near the lighthouse; if in such case a steam pilot vessel is coming from Wismar, the International Code signal denoting "await the arrival of the pilot steamer" is shown in conjunction with the former signal.

If the pilot is unable to board a vessel because of stormy conditions, the pilot boat will so indicate by International Code signal and will proceed ahead of the vessel, which must follow in her wake. The pilot will then

probably board the vessel in the inner channel in a position about 1 mile northwestward of Walfisch.

Directions.—Sounding is a good guide for approaching the dangerous shoals in the entrance to Wismar Bucht.

Vessels entering Wismar Bucht through Grosses Tief should approach the channel with Golwitz Light Beacons in range 165° and continue on this course until nearly abeam of Hannibal O Light Buoy. Thence vessels should alter course sharply to the southwestward because the cut in the channel here is very narrow. Vessels should continue southwestward to a position about $1\frac{2}{3}$ miles northward of Timmendorf Lighthouse, being guided by the buoys that mark the shoals on either side of the channel. At the latter position, Golwitz Light should bear about 085° ; with this bearing astern, vessels should steer westward into Kraken Tief until the light beacons on Hohen Wieschendorf Huk are in range $180\frac{1}{3}^{\circ}$.

From Kraken Tief, vessels should proceed southward on the Hohen Wieschendorf Range to a position about $1\frac{1}{4}$ miles northward of the point and close northward of Light Buoy K where the range (124°) formed by Walfisch Light Beacon and Poel-Walfisch Light Beacon is intersected. Vessels bound for Wohlenberger Wiek or the outer roadstead should now proceed to the respective destinations.

Vessels proceeding onward to Wismar harbor should steer for the latter range (124°) until nearly abreast of the front light beacon, wherefrom the last two reaches of the channel to the harbor are indicated by reciprocal ranges. The last three reaches of the channel are dredged and are marked by buoys, light buoys, and lighted piles.

5C-18 FACILITIES.—The city of Wismar, with a population of about 55,000 (1960), lies adjacent to the harbor basins. The principal industries are sugar refining, shipbuilding, distilling, metalworking, and the manufacture of railroad equipment and machinery. Sugar potash, salt, coal, and lumber products are the main exports. Grain, fertilizer, ores, lumber, and steel materials are the chief imports. The customs office is located in the harbor area.

Berths.—Commercial activity is centered in Kalihafen and Ueberseehafen. Alter Hafen has facilities for the fishing fleet. Werfthafen is used as a fitting-out basin by the shipyard.

Kalihafen has along its north side a berth where potash is loaded. It is 650 feet long with a depth of 8.2 m (26.9 ft.) alongside. On the south side of the basin there is a berth about 328 feet long with 5.0 m (16.4 ft.) alongside.

Ueberseehafen has a berth on its north side about 1,480 feet long with 8.2 m (26.9 ft.) alongside. On the south side of the basin there is a berth 655 feet long with 8.2 m (26.9 ft.) alongside. There is also a berth used by small craft as a fueling berth. The inner part of the basin is used as a yacht harbor.

Alter Hafen has about 1,970 feet of berthing space along its southwestern side with depths of 5.8 m (19.0 ft.) alongside.

Werfthafen is about 1,600 feet long on its east side and about 2,300 feet long on its west side; it has depths of 3.6 to 5.3 m (19.6 to 28.8 ft.).

An oil berth lies about 1/4 mile north-westward of the northern harbor entrance. It consists of a T-head pier about 330 feet long. Three dolphins are positioned off each end of the pier, and there are two mooring buoys. There is a depth of 8.2 m (26.9 ft.). Ships discharge via pipelines to railroad tank cars, and railroad tank storage, also to five oil tanks with a total capacity of about 12,000 tons, located inshore 1/4 mile northward.

All basins are served by the railroad. There are 10 cranes with capacities of 3 to 6 tons in Kalihafen, Ueberseehafen, and in Werfthafen. A floating crane with a 100-ton capacity is located in the port. There are also several grain elevators. Several tugs and two lighters of 250-ton capacity are available. Tugs are available.

Supplies.—Water is piped to all berths in the harbor. There is also a water barge. Fuel oil, diesel oil, and coal are obtainable. Provisions can be had but they are expensive.

Repairs.—The large shipyard in the harbor has facilities for general repairs. Cargo and passenger ships up to 7,000 tons are built on the several marine railways. Near the west end of the yard there is a feet alongside. There is a floating drydock 475 feet long and 97 feet wide, which can accommodate ships up to 10,000 D.W. tons. There is a floating crane of 50-ton capacity in the shipyard.

Communications.—The port is connected to the general railroad system. There is steamer communication with other Baltic ports and overseas ports.

Medical.—There is a hospital in the city.

Deratting.—See section 1-7.

ANCHORAGES

5C-19 Burgstaaken.—See section 5C-6.

Lübecker Bucht.—The depths in this bay are suitable for anchoring almost everywhere.

Neustadt.—See section 5C-8.

Off Travemünde.—See section 5C-9.

Wismar Bucht.—See section 5C-16.

Part D. MECKLENBURGER BUCHT—SOUTHERN AND EASTERN PARTS

5D-1 Buk Spitze ($54^{\circ}09' N.$, $11^{\circ}41' E.$) is a low point, but a short distance inland there are hills. The shorebank as defined by the 6-fathom curve extends up to about $13\frac{1}{4}$ miles offshore. **Buk Light** is shown about $11\frac{1}{4}$ miles south-southeastward of the point. **Storm signals** are displayed at the lighthouse.

GENERAL REMARKS

5D-2 The coast between Buk Spitze and Darsser Ort, about $35\frac{1}{2}$ miles northeastward, comprises the south and east shores of Mecklenburger Bucht. The coast first trends about 15 miles eastward to the vicinity of Warnemünde and thence curves northeastward to Darsser Ort.

Between Buk Spitze and the village of Heiligendamm, about $5\frac{1}{2}$ miles eastward, the land is wooded and high in the interior, but the hills do not approach the coast. There are several steep places along this shore. Farther eastward, to Warnemünde, the land becomes lower and is less wooded.

From Warnemünde to Darsser Ort, there are woods almost everywhere, except at Fischland, and sand dunes alternate with hills of moderate elevations. Fischland is the strip of lowland that lies about midway along this coast and separates a large inland sheet of water from the sea. A dike protects this lowland.

The Warnow River discharges at Warnemünde. The port of Rostock lies about 5 miles up the river.

There are a number of prominent landmarks, principally churches, along this coast; they are described with the related features. Several buildings in Warnemünde are conspicuous. Lights are shown in Warnemünde, at Wustrow, and Darsser Ort. There is a radiobeacon in Warnemünde.

Submarine cables are laid between Warnemünde and Falster.

An **ABNORMAL MAGNETIC DISTURBANCE** has been repeatedly observed about 8 miles northward of Warnemünde.

WATER LEVEL

5D-3 See section 5-2.

CURRENTS

5D-4 See section 5-3.

ICE

5D-5 See section 5-4.

DEPTHS

5D-6 The 6-fathom curve lies up to 1 mile offshore between Buk Spitze and a position about 1 1/2 miles westward of Warnemünde. On this shorebank there are numerous large stones. Farther offshore the depths increase rather regularly up to 13 fathoms.

Between the position westward of Warnemünde and Darsser Ort the 6-fathom curve lies up to 3 1/2 miles offshore, being, however, only about 1/2 mile offshore in the vicinity of Darsser Ort. There are numerous large stones on the southern part of this coastal bank.

Seaward of the 6-fathom curve the depths are irregular.

Wrecks.—Numerous unmarked wrecks with depths greater than 12.0 m (6.5 fm) lie seaward of the 6-fathom curve.

A dangerous sunken wreck, a wreck with a depth of 3.0 m (1.6 fm) and a buoyed wreck with a depth of 3.5 m (1.9 fm) lie, respectively, 7 miles southwestward, 4 miles west-southwestward and 4 miles west-northwestward of Darsser Ort.

COASTAL FEATURES

5D-7 **LAND MARKS.**—The conspicuous landmarks between Buk Spitze and Warnemünde are as follows: the beach hotels at the summer resorts of Arendsee, Brunsbaupten, and Heiligendamm, located about 1 1/2, 2 1/4, and 5 1/2 miles eastward of Buk Spitze; the churches at Steffenshagen and Doberan, located nearly 2 1/2 miles south-southwestward

and about 3 1/4 miles southeastward of Heiligendamm; Lichtenhagen Church, located about 3 1/4 miles southwestward of Warnemünde; and the church and lighthouse in Warnemünde. Doberan Church has a tall slender tower that is conspicuous from all directions. A beacon stands on the 420-foot summit located about 2 3/4 miles southward of Brunsbaupten.

MEASURED DISTANCE.—A measured distance of 2 miles, running east and west, marked by lighted and unlighted buoys, is located about 2 miles offshore, between Buk Spitze and Heiligendamm. Anchoring and fishing is prohibited within the area.

WARNEMÜNDE AND APPROACHES

Position: 54° 11' N., 12° 06' E.

Depths: Approaches, over 5 fathoms.
Anchorage, 6 to 7 1/2 fathoms.
Channels, 26 1/4 to 34 feet.
Harbor, 6 to 26 1/4 feet.
Berths, 9 to 26 1/4 feet.

Tides: Negligible.

Port plan: See Section 5D-10.

5D-8 Warnemünde, an outport for Rostock, occupies the mouth of the Warnow River. It is also the terminus of the ferry running to Gedser, Denmark.

WATER LEVEL.—Water fluctuations of 1 1/2 to 2 1/2 feet above the mean level occur frequently, particularly during the fall and winter months.

The water level rises when the winds are from a northwest to east direction, especially with a northeasterly gale when the water may rise to 8 feet. The water falls when the wind is from any direction between southeast to west; southwesterly to west-southwesterly gales may lower the water as much as 5 feet.

CURRENTS.—The current along the coast at the entrance to Warnemünde sets westward with winds from the north through east to south-southeast and eastward with winds from the south to north-northwest. The maximum rate of the eastgoing current was observed to be 3 knots.

In the Warnow River, if an offshore wind sets in suddenly after a period of onshore winds, the current sets out strongly; when the wind condition is reversed there is a strong incoming current. The outgoing current, which sets strongly along the east breakwater, has a maximum rate of 5 1/4 knots. The incoming current sets round the head of the east breakwater, and from the head of the west breakwater sets across the harbor.

Current signals for the information of ferries are shown from the ferry berth shortly before the arrival of ferries. These are described in detail below.

ICE.—The harbor remains ice free longer than Wismar and the German harbors eastward. The mouth of the river seldom freezes, and when it does, it is usually for a short period of time as the ice is broken by the rising water and is carried away by the current. The harbor is ice free with an outgoing current, and the ferry service from Warnemünde is interrupted only during very severe winters.

See table 6 in chapter 1 for additional information.

DEPTHS.—The 5-fathom curve lies nearly 1 1/2 miles northward of the west breakwater. In the roadstead there are depths of 6 to 7 1/2 fathoms. The depths a short distance eastward of the entrance channel within 4 miles of the harbor entrance are less than charted. Vessels with a draft exceeding 25 feet should not enter this area.

Two dredged channels lead into the harbor; the western channel has a depth of 26 1/4 feet and the eastern a depth of 34 feet. However, in 1959 it was reported that only ships with a maximum draft of 19 1/2 feet were permitted to use the swinging basin and the berths in the Neue Warnow. The eastern side of the swinging basin has a 34-foot dredged channel passing through it. Westerly and northwesterly gales form shoals in the channel, but it is maintained by dredging.

The dredged channel in the harbor has depths of 26 1/4 to 29 1/2 feet from the entrance to the shipyard. Alte Warnow has depths of 6 to 10 feet. Neue Warnow, the turning basin, and the harbor basin have a depth of 26 1/4 feet.

A dredged entrance channel, about 350 feet wide with a least depth of 34 feet, has been constructed close eastward of and parallel to the old east breakwater. At its southern end it joins Neu Warnow close northward of the turning basin and leads southward across Breitling to Petersdorf.

Pinnengraben is dredged to a depth of 29 1/2 feet and the basin off the naval base in Breitling is dredged to a depth of 21 feet.

The berths in the harbor have depths varying from about 9 to 26 1/4 feet.

APPROACH.—The approach from northward has fairly regular depths up to the 5-fathom curve. Warnemünde LIGHTED BELL BUOY, with a RADAR REFLECTOR, the approach buoy to Warnemünde from northward, lies about 13 miles northward of the entrance. The entrance to the harbor is easily recognized by the buildings and breakwaters.

Anchorage—Prohibited anchorage area—Dumping ground.—A 2-mile square open roadstead anchorage area, with depths of 13.5 to 17.5 m (7.3 to 9.5 fm), mixed clay and sand, lies centered about 4 miles northward of the entrance to the Warnow River. Lighted buoys mark the area. Stoltera Light, shown from a point 2 3/4 miles westward of the river entrance, forms the eastern limit of the anchorage area when bearing 187 1/2°.

A prohibited anchorage and fishing area extends about 8 miles northward from the coast between Stoltera Light and the entrance to the Warnow River. A submarine cable, passing through the area from Denmark, is landed close westward of the river entrance. Anchorage is prohibited in the river.

A dumping ground, marked by several buoys, extends about 3 1/2 miles northeastward from a position about 1 1/4 miles east-northeastward of the entrance to the Warnow River.

5D-9 NAVIGATIONAL AIDS.—Warnemünde Light is shown near the root of the west breakwater. A radiobeacon transmits nearby in conjunction with the submarine fog signal.

A pair of light beacons in range 176° are located on the central breakwater in the harbor and indicate the fairway of the entrance chan-

nel leading to Warnemünde. This channel is also marked by light buoys with radar reflectors; the outer lighted whistle buoy is moored about $2\frac{1}{4}$ miles northward of the harbor entrance.

Light beacons are also located on the heads of the west and east breakwaters; when the light on the west breakwater cannot be shown, two lights are shown vertically from a black and white circular beacon with a basket topmark located about 100 yards within the head of the same breakwater. A fog signal is sounded on the head of the west breakwater. West breakwater curves slightly northwestward at its head, and covers at high water and in a seaway.

The dredged channel which leads into the harbor close eastward of the old east breakwater is marked by lights and light buoys. Range lights in line $161\frac{1}{2}^\circ$ lead through the fairway of this channel to Petersdorf.

Other lights are shown in the harbor. During thick and foggy weather upon the arrival and departure of ferries, a fog signal is sounded and magnesium lights are burned at the ferry berth.

Harbor.—The entrance to the harbor is about 330 feet wide. It lies between two breakwaters that extend from the shore in a general north-northwesterly direction. A third breakwater extends in the same direction from the inner part of the harbor and divides the harbor into two parts. New east breakwater, located eastward of the old east breakwater, extends about 570 yards from the shore northward of Breitling.

Alte Warnow, the western basin, is used only by fishing vessels and pleasure craft. A draw bridge, with a 33-foot opening, spans the basin in its inner part.

Neue Warnow, the eastern basin, is also the channel leading to the port of Rostock. The basin is about 200 feet wide and the fairway in it is about 130 feet wide. The western side of the basin is quayed for berthing.

The ferry terminal lies just westward of the northern entrance to Neue Warnow and con-

sists of two berths. A chain ferry crosses Neue Warnow just northward of the main berth. Signals governing ferry traffic across the channel are described in detail below.

The turning basin is located at the southern end of Neue Warnow. It is about 1,300 feet long and has a maximum width of about 800 feet. There are berthing facilities along the quay on the northwest side of the basin.

The harbor basin lies to the southwestward of the turning basin and is quayed on both sides. This basin is used by the shipyard for ship repairs and fitting-out of vessels.

A large shipyard lies southward of the turning basin on the west side of the channel.

Pinnengraben, the entrance to the channel leading to the naval base in Breitling, lies to the eastward of the shipyard and is entered between an islet and the mainland. The naval base lies in the northern part of Breitling.

Traffic Control Station.—A traffic control station is at the pilot station near Warnemünde Lighthouse to regulate shipping in Warnemünde Road, the sea channel, Warnow River and adjacent channels. Two hours notice is required for movement of vessels.

Pilotage.—Pilotage is compulsory for vessels over 100 gross tons. Pilots are stationed near Warnemünde Lighthouse and will take vessels into the harbor at night. They board vessels in the roadstead, seaward of the buoyed entrance channel or, during foul weather, within the entrance to the Warnow River.

Signals.—There is a signal station close northeastward of Warnemünde Lighthouse. No regular lookout is kept. Storm signals are shown here by day and at night.

Traffic signals are shown from the central mole. By day one black ball signals, entry permitted, departure prohibited; two black cones, points together signals, departure permitted, entry prohibited. By night, one green light signals, entry permitted; one red light signals entry prohibited. Three black balls or three red lights, vertically displayed, signal entry and departure prohibited.

At the ferry terminal, current signals are displayed by means of a pointer revolving on a disk. The pointer is shown on the eastern half of the disk for an incoming current and on the western half for an outgoing current as follows:

Vertically downward indicates no current.

Diagonally downward indicates weak current.

Horizontally indicates strong current.

Diagonally upwards indicates very strong current.

At night, the position of the pointer is indicated by means of three white lights.

The chain ferry carries at night a white light both forward and aft.

The waving of a red flag by day or a red light at night from the ferry means that a vessel must stop and receive verbal instructions as to what side to pass the ferry.

If the chain ferry should stop while crossing the channel, two black balls by day or two red lights, vertically displayed, at night will be shown from the mast on the ferry and the two white lights will be doused; at such times vessels must pass the ferry at a slow speed, unless directed to stop.

Vessels must pass the ferry on the side from which the ferry has departed.

Vessels are forbidden to make sound signals in the immediate proximity of the ferry, except those for the Prevention of Collisions at Sea.

Directions.—In approaching Warnemünde in clear weather, the church towers in Rostock are seen first. Warnemünde Lighthouse, the church tower, and other large buildings will become visible upon closer approach.

From the anchorage area northward of Warnemünde the buoyed entrance channel which is marked by range lights leads into the harbor and thence continues into Basin B at Überseehafen. Range lights, located on the middle breakwater, mark the cut off channel leading westward of Old East Mole into the Neue Warnow.

5D-10 FACILITIES.—The city of Warnemünde, with a population of about 25,000 (1955), is concentrated on the west side of the harbor. It is incorporated with Rostock. In addition to being a popular seaside resort, it builds and repairs ships and handles

transshipment cargoes. The principal exports are coal, cement, sugar, and mixed cargo. The chief imports are metal and ores, foodstuffs, and fertilizers. There is a customs office in the harbor.

In Alte Warnow there are depths of 1.5 to 3.0 m (4.9 to 9.8 ft.) alongside the quays.

The berth in the southern part of Neue Warnow is about 830 feet long and has a depth of 26½ feet alongside. The berth on the northwest side of the turning basin is about 1,000 feet long and has a depth of 26½ feet alongside; about 160 feet of the latter berth, at the northeast end, is used only for bunkering purposes.

The harbor basin is used by the shipyard for repairs and fitting-out of vessels. On the northwest side there is a berth about 800 feet in length and on the southeast side there are two berths, about 800 feet and 400 feet in length; there is a depth of about 19½ feet alongside these three berths.

The main berths are served by the railroad and are equipped with 2- to 6-ton cranes. One 100-metric ton floating crane is available.

Water is laid onto the main berths. Oil is obtainable only in small quantities for local use. Tugs are available. All vessels over 400 tons, or exceeding 230 feet in length, must take a tug when entering or leaving the harbor.

The shipyard has facilities for all kinds of repairs. There are two floating drydocks. The dimensions of the larger dock are: maximum length, 579 feet; length over keel blocks, 543 feet; width overall, 112 feet; depth of dock basin, 44 feet; lifting power, 11,000 tons.

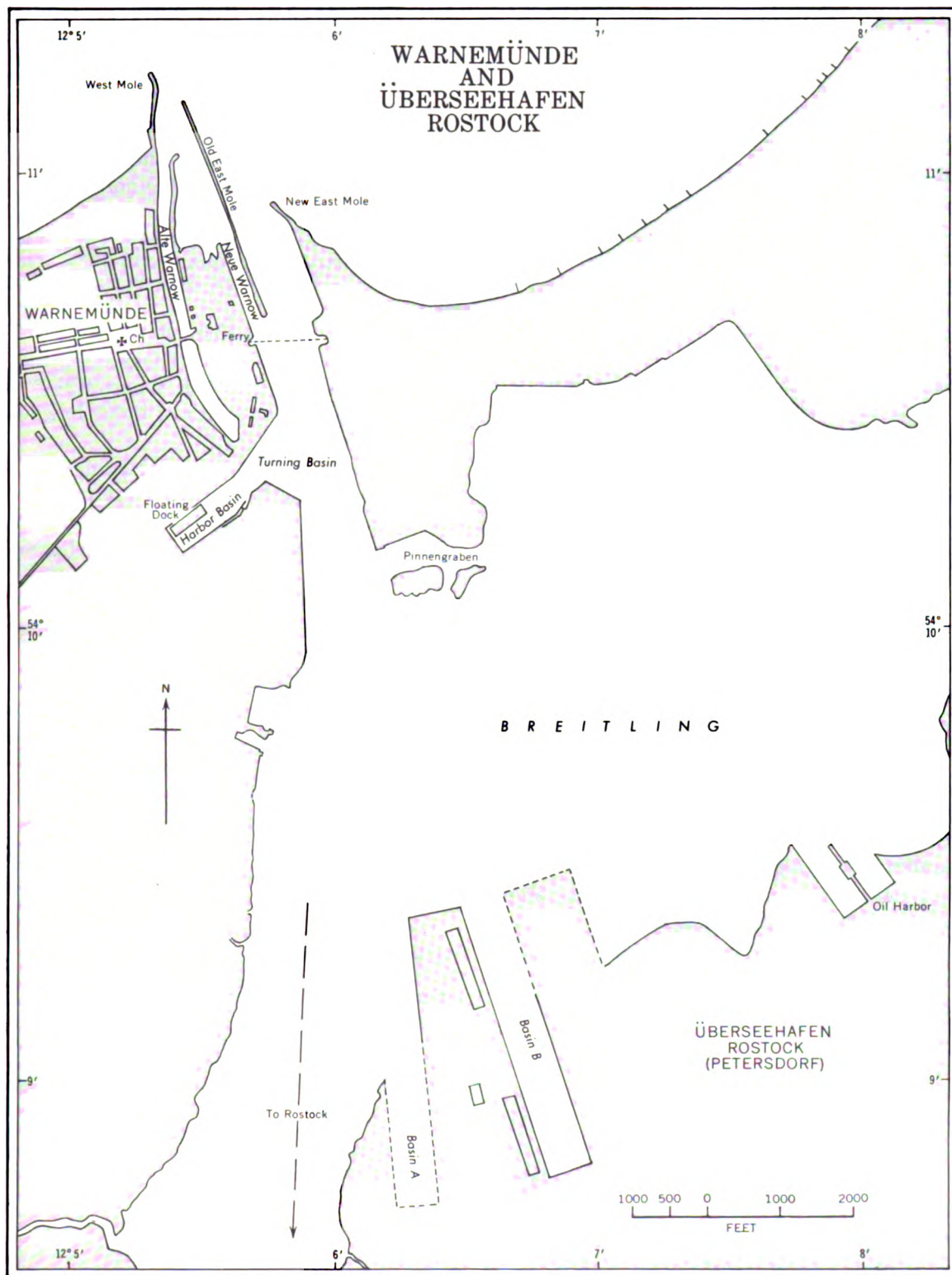
Warnemünde is connected with the general railroad system. The train ferry runs to Denmark.

ÜBERSEEHAFEN (PETERSDORF)

Überseehafen, the deep water port for Rostock, is an artificial harbor consisting of 2 basins and a tanker harbor, and is located about 1½ miles south-southeastward of Warnemünde. Warnemünde entrance range continued leads through a dredged channel, marked by buoys, into Basin B the eastern basin. Basin A lies about ¼ mile westward of Basin B. A buoyed channel, marked by range lights, leads eastward from the turning basin northward of Basin B to the oil harbor.

Basins A and B have about 2 1/4 miles of quays with depths of 11.0 m (36.0 ft.) alongside. The tanker harbor has two berthing places for vessels drawing 33 feet; the connecting channel is 164 feet wide and has a charted depth of 11.0 m (36.0 ft.). A berthing area westward of Basin A is under construction; in 1969, a berthing length of about 580 yards had depths of 11.0 m (36.0 ft.).

In 1968, the deepest draft permitted in Überseehafen was 33 feet.



ROSTOCK

Position: 54°06' N., 12°08' E.
Depths: River channel, 26¼ feet.
 Harbor, 20 to 23 feet.
 Berths, 16½ to 27¾ feet.
Port plan: See "FACILITIES."

5D-11 The port of Rostock lies at the head of the Warnow River estuary about 5 miles above Warnemünde. A narrow channel is dredged in the river and leads to the port. The harbor consists of a quayed waterfront on the south side of the river.

Ice.—The river between Warnemünde and Rostock freezes sooner than that at the mouth, but it is kept open by icebreakers.

Depths—Draft.—The channel between Warnemünde and Rostock is maintained by dredging. The section of the channel between Warnemünde and the branch channel to Marienehe has a charted depth of 9.0 m (29.5 ft.) (1966); thence, the channel has a least charted depth of 6.9 m (22.6 ft.) (1966) as far as Kohlenkai in Rostock. Depths alongside berthing facilities range from 3.4 to 7.7 m (11.1 to 25.2 ft.). The river upstream of the harbor area has depths of 2.7 to 3.3 m (8.8 to 10.8 ft.).

In 1967, the deepest draft permitted as far as Rostock was 21 feet.

Warnow River between Warnemünde and Rostock.—The river is navigable by oceangoing vessels as far as Rostock. At the eastern end of Rostock harbor the depths are considerably less than in the dredged channel, and the river is spanned by a bridge that has a horizontal clearance of 60½ feet.

In general, the banks of the river are flat and woodless. There is a sparsely wooded area on the east bank northward of Oldendorf, located about midway between Warnemünde and Rostock.

About 3 miles southward of Warnemünde there are two channels that branch off southwestward from the river channel. The northern channel leads to the basin of the fishing combine at Marienehe and the southern channel leads to the slaughter house at Bramow.

The basin at Marienehe has depths of 6.2 to 6.5 m (20.3 to 21.3 ft.); Warnowkai, close northward, has 7.7 m (25.2 ft.); the channel leading to the basin is about 115 feet wide at the bottom.

Navigational aids.—The river channel is marked by dolphins and buoys, lighted and unlighted, in accordance with the uniform system (sec. 1-29). The fairway in the northern part of the channel is indicated by a pair of lights in range 186° astern on the east side of the river abreast the turning basin in Warnemünde; other lights are also shown in this general vicinity.

The fairway in the channel leading to the fishing combine is marked by buoys and is indicated by a pair of lights in range 212½° at Marienehe and also by a pair of lights in range 032½° at Oldendorf.

The fairway in the channel leading to the slaughter house at Bramow is indicated by a pair of lights in range 216½° in Bramow.

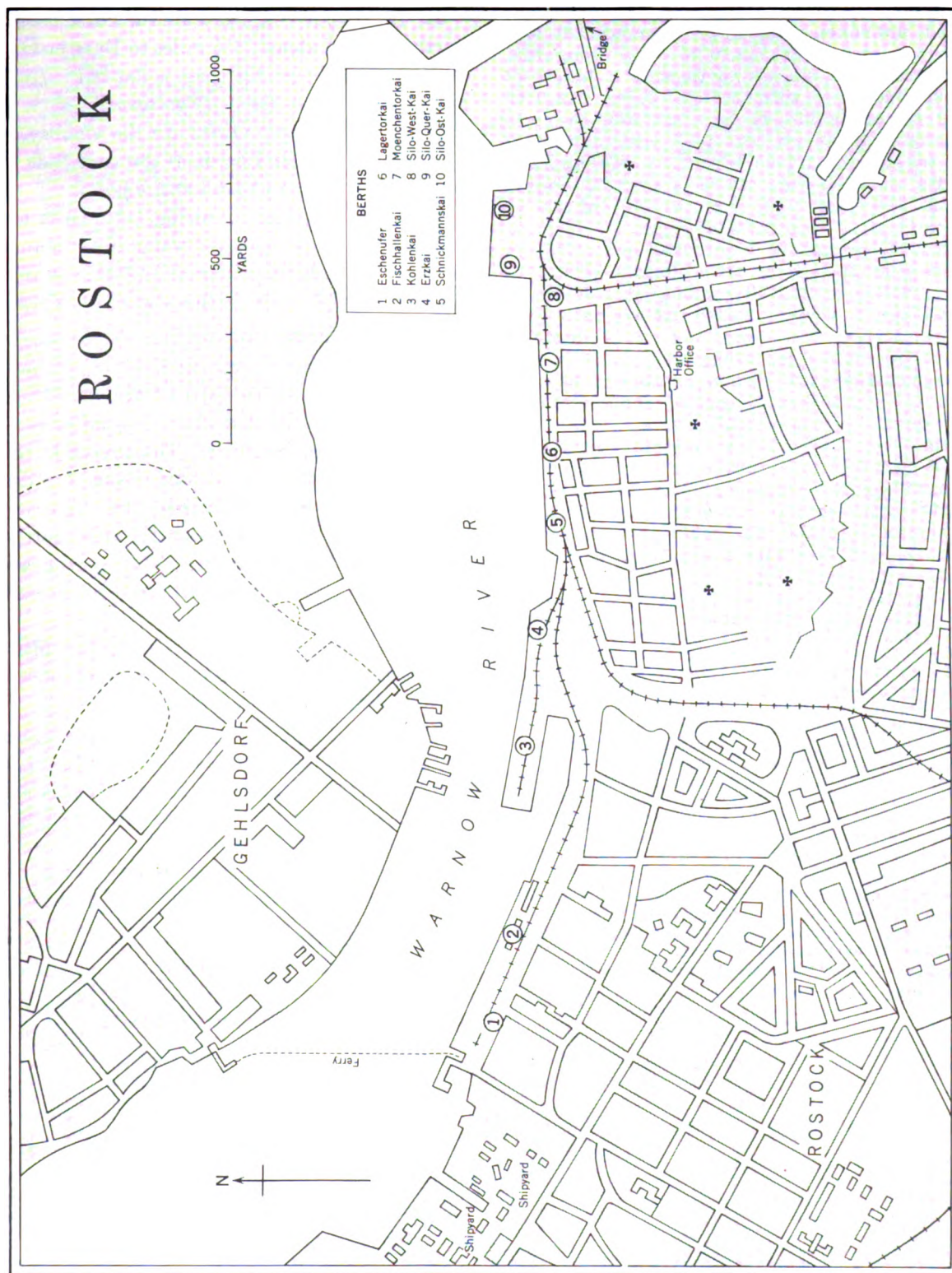
Other lights are shown in Rostock harbor and at Bramow.

Harbor.—The waterfront is quayed for a distance of about 1 mile. About midway along this waterfront, Kohlenkai, a mole, projects westward almost parallel to the shore and forms a shallow basin. The depths alongside the berths at the quays vary from about 16½ to 27¾ feet.

A shipyard lies on the south side of the river just westward of the quayed waterfront.

A ferry crosses the river at the western end of the harbor. **Submarine cables** are laid across the river.

FACILITIES.—The city of Rostock, with a population of about 188,000 (1967), is located on the south side of the river. It is a rail junction and the largest port in Soviet-occupied Germany. Its main industries are the manufacture of agricultural machinery and chemicals, metalworking, brewing, and distilling. The chief exports are coal, machinery and parts, optical instruments, and cement. The principal imports are ores, finished steel, grain, timber, and fertilizer. There is a customs office in the harbor.



Berths.—On the west side of the harbor, Eschenufer and Fischhallenkai have a combined unbroken length of about 1,500 feet with 5.5 to 6.1 m (18.0 to 20.0 ft.) alongside. Kohlenkai has on its north side a length of about 920 feet with 5.5 to 6.7 m (18.0 to 21.9 ft.) alongside; on its south side there is a length of about 660 feet with depths of 3.4 to 4.9 m (11.1 to 16.0 ft.) alongside, and on its western side there is a waiting berth about 190 feet long with depths of 4.9 to 5.5 m (16.0 to 18.0 ft.) alongside.

Erzaki, adjoining Kohlenkai eastward, is about 700 feet long with depths of 5.5 to 6.7 m (18.0 to 21.9 ft.) alongside. Schnickmannskai, a waiting berth for ore carriers, is about 600 feet long and has a depth of about 6.0 m (19.6 ft.) alongside.

Lagertorkai and Moenchentorkai have a combined unbroken length of about 950 feet with depths of 6.0 m (19.6 ft.).

Silo-West-Kai has a berthing length of about 510 feet with depths of 6.1 m (20.0 ft.) alongside. Silo-Quer-Kai has a berthing length of about 330 feet with 6.1 m (20.0 ft.) alongside. Silo-Ost-Kai has a berthing length of about 655 feet with 4.9 m (16.0 ft.) alongside.

All the berths except Silo-Quer-Kai and Silo-Ost-Kai are served by the railroad. Traveling cranes with capacities of 2 to 10 tons stand on some of the berths. There is a 65-ton floating crane in the shipyard. At the grain berths at the eastern end of the harbor there are several suction elevators. Kohlenkai is equipped with 3 coal-loading bridges. Several tugs are available in the harbor.

Supplies.—Water is piped to each of the berths.

Repairs.—The shipyard has extensive facilities for repairing ships. There is a marine railway capable of handling ships up to 260 feet in length. There are also several floating drydocks, the largest of which can handle ships up to 460 feet in length. There are several cranes of 15 to 20 tons capacity, and a derrick and a floating crane of 100-ton capacities.

Communications.—The city is connected with the general railroad system. Steamers call from other Baltic and overseas ports. Postal and telegraph facilities are available in the town.

Medical.—The city has hospital facilities.

Deratting.—See section 1-7.

COASTAL FEATURES (Continued)

5D-12 From Warnemünde the coast trends northeastward about 23½ miles to Darsser Ort. In its southern part the coast is flat but farther northeastward it rises. Northward of Wustrow there are steep cliffs. In the vicinity of Darsser Ort the land becomes low and ends in a flat sandy tongue of land at the point.

Landmarks.—The following landmarks are prominent on this coast: A water tower stands between the villages of Graal and Müritz in a position about 7 miles northeastward of Warnemünde Lighthouse. Müritz is a seaside resort. A beach hotel stands near the shore at Neuhaus about 2 miles northeastward of Müritz. Dierhagen Church is located about 1½ miles east-northeastward of Neuhaus. The church at the village of Wustrow is located about 7 miles south-southwestward of Darsser Ort. A beach hotel stands on the coast about 2¼ miles north-northeastward of Wustrow. The lighthouses at Wustrow and Darsser Ort are also prominent.

Margrafenheide Light is shown at Margrafenheide about 3 miles east-northeastward of Warnemünde Light.

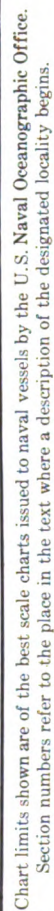
Wustrow Light is shown near the coast southwestward of Wustrow. A fog signal is sounded at the lighthouse. Storm signals are displayed by day and at night from a signal mast near the lighthouse.

Anchorage.—There is good anchorage off Wustrow in 5½ to 6½ fathoms, sand over clay.

ANCHORAGES

5D-13 Off Warnemünde.—See section 5D-7 and 5D-8.

Off Wustrow.—See section 5D-12.



CHAPTER 6—GRAPHIC INDEX

CHAPTER 6

DANISH COAST: GEDSER ODDE TO MØN LIGHT—GERMAN COAST: DARSSER ORT TO KAP ARKONA

Part A. Gedser Odde to Møn Light

Part B. Darsser Ort to Kap Arkona

Plan.—This chapter describes the waters that connect the western Baltic Sea with the Baltic Sea proper. The Danish coast between Gedser Odde and Møn Light is described first, followed by a description of the German coast between Darsser Ort and Kap Arkona. The sequence of the description is from south to north on the Danish coast and from west to east on the German coast.

GENERAL REMARKS

6-1 The waters between Mecklenburger Bucht and the Baltic Sea proper have about the same characteristics as those of the western Baltic Sea. The depths are irregular and rather shallow, being less than 10 fathoms over the greater part of the area, and sunken wrecks are interspersed throughout. In addition there are several detached shoal patches in the general vicinity of the fairway.

Danish coast.—The east coast of Falster and the south coast of Møn comprise the northwest side of these waters. The coasts of these islands are low in some places and rather high in other places. There are wooded areas on the higher ground in the vicinity of the entrance to Grønsund and near the remarkable white cliffs at the eastern end of Møn. Elsewhere the islands have highly cultivated areas and open fields. The low southern coast of Falster is protected by a dike.

Grønsund, the main entrance to Smaalands Farvandet from eastward, lies between Falster and Møn. Hjelm Bugt is the large indentation on the south side of Møn; its shore consists of a low sandy beach.

There are two small harbors on these islands, Hesnæs on Falster and Klintholm on Møn.

German coast.—The mainland eastward of Darsser Ort is known as the Zingst peninsula. It is about 16 miles long, alternates between sand dunes and pine forests, and has at its eastern end an extensive sandbank with several islets on it. Southward of this peninsula there is a series of interconnected shallow bays that extend as far westward as Fischland (sec. 5D-2).

Rügen, an irregularly shaped island, is separated from the mainland by a fairly narrow passage. The island is generally low on the western and southern sides but attains high elevations on its northern and eastern sides. The northern part of the island is intersected by several shallow bays, access to which is made from the westward. Kap Arkona is the northern end of the island.

Hiddensee, a long narrow island, lies off the northwestern side of Rügen. There are channels on both sides of the island that lead to the passage between Rügen and the mainland. The western channel, the deeper one, also leads to a secondary channel that provides access to the series of bays on the mainland. The eastern channel is also the approach to the secondary channel leading to the shallow bays in the northern part of Rügen.

The port of Stralsund is located on the mainland in the passage between Rügen and the coast. It may be approached from northward through the aforementioned channel or from the eastward through Greifswalder Bodden (See H. O. Pub. No. 43). A dam crosses the passage in the vicinity of Stralsund. A bridge near each shore end interrupts the continuity of this dam. The eastern bridge is fixed; the western bridge is a bascule bridge that opens into Stralsund harbor.

There are also two small harbors in this area; Barhöft is located on the mainland southwestward of Hiddensee and Barth lies at the head of the bay about 11 miles west-southwestward of Barhöft.

Submarine cables are laid from Barhöft to Sweden.

WATER LEVEL

6-2 The water level in this area as in other places in the western Baltic Sea is little affected by tidal action. The change in the water level is caused primarily by strong winds, particularly sustained strong winds from one direction.

The water level varies according to localities. In the German waters between Zingst and Rügen the water level may be raised as much as 4 feet with winds from a direction between north and east and lowered the same amount with winds from a direction between south and west.

On the Danish coast in the harbor of Hesnæs, northeasterly winds may raise the water level as much as 5 feet and southwest winds may lower it the same amount. Farther northward in the harbor of Klintholm, east-northeasterly gales may raise the water level 2 to 3 feet and west-southwesterly gales may lower it the same amount.

During very strong gales, the water level is raised even higher than the above-mentioned figures. At such times, there is flooding of the low land on the German coast.

CURRENT

6-3 In general, during calm weather the water flows from the Baltic Sea proper toward Mecklenburger Bucht and Fehmarnbelt at a rate of about 1 to 2 knots. During gales the current generally sets with the wind in the open sea and may reach a rate of 3 to 4 knots near the shore. In the passage between Rügen and the mainland, the currents may attain a rate of about 5 knots.

The directions and rates of the currents in this part of the Baltic Sea are shown in figures 2 through 10.

ICE

6-4 See section 5-4 and chapter 1 for information on general ice conditions in this area. Details of ice for individual ports are given with the respective descriptions.

Off Kap Arkona, ice has been known to form as early as the first week of November and remain as late as the latter part of April. On the average, ice forms in the middle of January and disappears during the latter part of March.

Part A. GEDSER ODDE TO MØN LIGHT

6A-1 Gedser Odde ($54^{\circ}34' N.$, $11^{\circ}59' E.$), the southern end of Falster, is described in sections 5-1 and 5B-4.

GENERAL REMARKS

6A-2 The east coast of Falster and the south coast of Møn lie between Gedser Odde and Møn Light, about $30\frac{1}{4}$ miles northeastward, and comprise the coastal area described herein. Grønsund, the passage between Falster and Møn, and its approach channels, are described in sections 7C-13 through 7C-18.

The general features of this coast are described briefly in section 6-1 and the details are described with the coastal features.

WATER LEVEL

6A-3 See section 6-2.

CURRENTS**6A-4** See section 6-3.**ICE****6A-5** See section 6-4.**DEPTHS**

6A-6 The depths in the Danish waters between Gedser Rev and Møn Light are rather irregular. Seaward of the 5-fathom curve, which lies up to about $3\frac{1}{4}$ miles offshore, the depths increase to 13 and 14 fathoms. On the whole, however, the depths are predominantly less than 10 fathoms. Off Møn Light, depths up to 18 fathoms exist.

Seaward of the shorebank there are sunken wrecks interspersed throughout this area but none of which is known to have a depth of less than 6 fathoms.

COASTAL FEATURES

6A-7 East coast of Falster.—This coast lies between Gedser Odde and Hestehoved, about 18 miles north-northeastward. The east side of Gedser Odde is a low cliff. For about 10 miles northward from Gedser Odde the coast is low and has a sandy beach backed by low clay banks or sand dunes, in turn backed by low wooded terrain. A dike protects this low coast between Gedser Odde and the vicinity of the village of Bøtø, about 7 miles northward. Northward of the dike there is a high clay cliff for a distance of about 2 miles. Farther northward as far as Hestehoved, the coast consists of wooded banks that rise to elevations of over 30 feet.

A submarine cable is laid from Falster to Bornholm. The shoreward end about $6\frac{3}{4}$ miles southwestward of Hestehoved is marked by range beacons.

The shorebank as defined by the 5-fathom curve extends up to about $3\frac{1}{4}$ miles from the southern part of this coast and up to 2 miles from the northern part of the coast. Off Hesnæs, a shoal patch consisting of stones and having a least depth of 2.2 m (7.2 ft.) lies nearly $1\frac{1}{2}$ miles offshore; a buoy is moored in a depth of about 5.9 m (19.3 ft.) close eastward of this danger.

The churches at Gedesby (sec. 5B-4), Skelby (sec. 5B-4), and Vigerløse and the farm at Bøtø are prominent landmarks. Vigerløse is located about $2\frac{1}{2}$ miles northwestward of Bøtø.

Hestehoved is the southern entrance point of Grønsund. A light is shown on the point. A radiobeacon transmits here.

Hesnæs.—This small harbor lies nearly $\frac{1}{4}$ miles southwestward of Hestehoved. It consists of an artificial basin nearly enclosed by breakwaters. The entrance has a dredged depth of 10 feet and is open to the southwestward. In the harbor there are depths of 6 to 10 feet.

Northeast winds may raise the water level as much as 5 feet and southwest winds may lower it the same amount.

A pair of lights in range $018\frac{1}{2}^{\circ}$ are shown in the harbor and indicate the immediate approach to the harbor entrance.

The harbormaster will pilot vessels into and out of the harbor. Because there is silting near the east breakwater head, vessels are advised to keep clear of it when entering.

There are watering, fueling, provisioning, and repair facilities for local small vessels. The harbor has customs service.

Grønsund.—The entrance to this passage lies between Hestehoved and Madses Klint, about 3 miles north-northeastward. The whole entrance is occupied by shifting sands, known as Tolken, which extend almost up to the 5-fathom curve and are steep-to. The fairway buoy, a **lighted whistle buoy**, of the main fairway in Grønsund is moored about $1\frac{2}{3}$ miles southeastward of Hestehoved. Grønsund is described in greater detail in sections 7C-15, 7C-16, and 7C-17.

SOUTH COAST OF MON.—This coast lies between Madses Klint and Mon Light, about $12\frac{1}{4}$ miles east-northeastward. The western part of the coast is fairly high and rises steeply from the sea in several places. Farther eastward the coast is low, thence becomes high and wooded as Mon Light is approached.

Madses Klint is a small yellow cliff 66 feet high. The land for about 2 miles northeastward of this cliff is wooded. Hjelm Klint, located about 4 miles northeastward of Madses Klint, is a prominent white cliff. Other landmarks are Hjelm Mill, located about 3 miles northeastward of Madses Klint; Stege Church and the chimney of Stege Sugar Factory, both located nearly 7 miles northeastward of Madses Klint; Elmelunde Church, located about $5\frac{2}{3}$ miles west-northwestward of Mon Light; Magleby Church, located about 3 miles northwestward of Mon Light; the houses at Klintholm; and the lighthouse of Mon Light.

A radio mast, 328 feet high and on which is shown an obstruction light, stands close northwestward of the harbor of Klintholm.

The shorebank as defined by the 5-fathom curve lies within about $1\frac{1}{4}$ miles of the western shore, within about 1 mile of the northern shore, and within 2 miles of the coast at Mon Light. Several detached stony patches with depths varying from $18\frac{1}{2}$ to 26 feet lie close seaward of the 5-fathom curve off the western shore, but none lies more than $1\frac{1}{4}$ miles offshore.

The embayment on the south side of Mon is known as Hjelm Bugt and has regular depths of 5 to 12 fathoms outside the coastal bank. With offshore winds there is anchorage anywhere under the coast over a bottom that is mainly sand.

Klintholm lies about $2\frac{1}{2}$ miles west-northwestward of Mon Light. The harbor is a small artificial basin formed by moles and has an entrance, about 50 feet wide, that is open to the westward. A light is shown and a fog signal is sounded from South Mole. A light is shown from North Mole.

Harbor depths are: Outer Basin, 1.5 to 3.0 m (4.9 to 9.8 ft.); Middle Basin, 0.6 to 3.0 m (1.9 to 9.8 ft.); Inner basin, 0.5 to 2.8 m (1.6 to 9.1 ft.). There is a depth of 2.5 m (8.2 ft.) in the entrance which is subject to silting. Depths must be maintained by dredging.

The mean tidal range is about 1 foot, but with gales it may be 2 or 3 feet. East-northeasterly gales cause the highest water and west-southwesterly gales cause the lowest water. The eastgoing current is deflected by the harbor and sets southward past the harbor entrance. Southerly to southwesterly winds raise a sea in the outer part of the harbor; the inner part is sheltered with all winds.

There is no pilot. A vessel displaying a flag at the foremast will be assisted into the harbor by a local fisherman.

Water and provisions are obtainable. There is customs service in the harbor.

A motor lifeboat is stationed at Klintholm.

ANCHORAGE

6A-8 HJELM BUGT.—See section 6A-7.

Part B. DARSSER ORT TO KAP ARKONA

6B-1 DARSSER ORT ($54^{\circ} 29' N.$, $12^{\circ} 32' E.$) is a low sandy point backed by dunes and a lake. A spit on which there are some rocks fronts the point to a distance of about $\frac{1}{2}$ to $\frac{3}{4}$ mile. A lighted bell buoy is moored in a depth of about 23 feet off the northeast side of this spit in a position about $1\frac{1}{4}$ miles northeastward of the point.

The shorebank as defined by the 5-fathom curve extends up to about $\frac{1}{2}$ mile northward from the point. Prerow Bank, with a least depth of $11\frac{1}{2}$ feet, lies on this shorebank with its shoalest spot located about 3 miles eastward of the extremity of the point.

WRECKS.—A dangerous sunken wreck lies, respectively, 4 miles north-northwestward and 4 1/2 miles north-northeastward of Darsser Ort; a wreck, with a depth of 9.5 m (5.1 fm) and marked by two lighted buoys, lies about 12 miles northward of the same point.

DARSSER ORT LIGHT is shown about 1/2 mile southwestward of the northern extremity of Darsser Ort. A fog signal is sounded at the light station. Storm signals are displayed by day and at night from the signal station a short distance northeastward of the light structure.

PROHIBITED AREAS.—An area closed to navigation and fishing, extending about 1 mile offshore, lies northward of Darsser Ort; a lighted bell buoy marks the northeastern corner of the area.

A temporary area closed to navigation lies between Darsser Ort and Hiddensee and extends about 10 miles northward from Zingst Peninsula.

GENERAL REMARKS

6B-2 The mainland and the islands lying between Darsser Ort and Kap Arkona, about 33 1/2 miles east-northeastward, and the inland waters that are accessible from this coast are described herein. The southern limit of the inland waters within the scope of this volume is the port of Stralsund.

In general, the mainland and islands are fairly low except for the northern ends of Hiddensee and Rugen, the latter being particularly prominent by reason of its chalk cliffs. Additional details are given in section 6-1 and in the description of the coastal features in section 6B-7.

The inner waters are for the most part shallow; a depth of 16 1/2 feet is maintained by dredging in the channel to the port of Stralsund. There are two entrances to the inner waters, one on each side of Hiddensee, and both are obstructed almost completely by shoals and sandbanks.

The main approach channel from the sea to the inner waters is entered southwestward of the northern end of Hiddensee and leads along the western side of this island. The other approach channel is entered between the northern end of Hiddensee and Der Bug, a

narrow tongue of land that is part of the island of Rugen, and leads along the east side of Hiddensee. Both of these channels unite in the northern entrance of Stralsunder Fahrwasser, which leads to the port of Stralsund.

Secondary channels branch off from the above two channels and lead to some of the villages that are located in the various bays of the inner waters.

Lights are shown on Hiddensee and on Kap Arkona. Range lights indicate the fairway in the main channel. The principal and secondary channels are marked by buoys.

WATER LEVEL

6B-3 See section 6-2 for the coastal area. The water level for the inner waters is given with the description of the related features.

CURRENTS

6B-4 See section 6-3 for the coastal area. The currents in the channels in the inner waters are given with the description of the related features.

ICE

6B-5 See section 6-4 for the coastal area. Ice conditions in the inner waters are described with the related features.

DEPTHS

6B-6 For the most part, the depths off this coast are less than 10 fathoms. Between Darsser Ort and the west side of the northern end of Hiddensee the 5-fathom curve lies from about 3 1/2 to 7 1/2 miles offshore. From Hiddensee to Kap Arkona, the 5-fathom curve follows a regular trend and lies about 1/2 mile off the northern ends of these two islands. A dangerous sunken rock lies about 7 miles westward of Gellen Light.

A steep-to rock with a depth of 1 1/2 fathoms lies seaward of the 5-fathom curve in a position about 1/2 mile northwestward of Dornbusch Lighthouse. A dangerous wreck marked by a buoy lies sunk about 1 1/2 miles northwestward of the same lighthouse.

The depths and dangers inside the 5-fathom curve are described with the coastal features.

KADET BANK with a least depth of 6 fathoms lies in the northeastern approach to Kadet Rinne in a position about 7 1/4 miles northwestward of Darsser Ort Light. A lighted buoy is moored about 2 miles north-northwestward of Kadet Bank.

PLANTAGENET GRUND, a group of shoal patches having a least depth of 7.4 m (4.0 fm), lies between about 12 and 14 1/4 miles northeastward of Darsser Ort.

COASTAL FEATURES

6B-7 ZINGST PENINSULA.—From about 1 3/4 miles southward of Darsser Ort the coast of this peninsula trends regularly eastward for about 13 miles. The village of Pramort is located about 1 mile farther southeastward on the eastern extremity of this peninsula.

Excepting Prerow Bank the depths between the 5-fathom curve and the shore decrease rather uniformly and there are no known dangers.

The villages of Prerow and Zingst are located near the coast in positions about 3 miles southeastward and about 6 miles east-southeastward of Darsser Ort. The church at the village of Barth, located on the southern side of one of the inland bays about 9 3/4 miles southeastward of Darsser Ort, is also prominent.

During westerly winds there is sheltered anchorage in 3 1/4 to 3 3/4 fathoms, sand, in the bight on the east side of Darsser Ort in a position about 1 1/2 miles eastward of Darsser Ort Light.

Der Bock is the extensive drying sandbank that extends nearly 5 miles eastward from Zingst peninsula, almost to the southern end of Hiddensee. Several low islands lie along the entire stretch of these sands. A large shoal area as defined by the 3-fathom curve extends nearly 7 miles northward from the islands on Der Bock. The main channel leading to the inner waters passes over this shoal area. This channel and the guiding

lights on Der Bock are described in greater detail in section 6B-9.

A wreck lies about 5 1/4 miles northward of Pramort.

NORTH AND WEST SIDES OF HIDDEN-SEE.—The north end of Hiddensee is known as Dornbusch. It attains an elevation of 237 feet and has a steep seafloor. The remainder of the island is low and sandy. There are several villages on this island.

Dornbusch Light is shown on the northern end of Hiddensee. A fog signal is sounded at the light station. Storm signals are displayed by day and at night at the signal station close northward of the lighthouse.

Gellen Light is shown in a position about 3 miles northward of the southern end of Hiddensee. A beacon with a white triangular topmark stands a short distance eastward of the light station. The light structure and beacon are in range 106°.

Libben, the waters between the northern part of Hiddensee and Rugen, is one of the entrances to the inner waters and is described in section 6B-9 with the approaches to Stralsund.

Two green conical buoys, marking experimental equipment, are moored about 1/3 mile northeastward of the northeastern extremity of Hiddensee.

NORTHERN END OF RUGEN.—Wittow is the northern part of Rugen and Kap Arkona is its northeastern extremity. The north side of Wittow lies between the village of Dranske and Kap Arkona, about 8 miles east-northeastward. Dranske is located about 4 miles northeastward of Dornbusch and close northward of the isthmus that connects the peninsula of Der Bug with Rugen.

In the vicinity of Dranske the coast is low but farther northeastward and eastward it rises gradually. For several miles westward of Kap Arkona the coast is steep and has elevations of over 100 feet; at the cape there are precipitous chalk cliffs 148 feet high.

NOTE.—The light and other navigational aids on Kap Arkona as well as the coast farther eastward are described in H. O. Pub. No. 43, Sailing Directions for the Baltic, Volume II.

STRALSUND AND APPROACHES

Position: 54°19' N., 13°06' E.

Depths: Sea to harbor, 16½ feet.

Harbor, 20 feet.

Berths, 11½ to 19½ feet.

6B-8 The port of Stralsund is located on the mainland in the inner waters in a position about 8½ miles southward of Hiddensee. Several breakwaters and the island of Dänholm form the outer perimeter of the harbor and afford it protection. The city of Stralsund lies adjacent to the harbor area.

The port has two approaches; one from the eastward through Greifswalder Bodden and the other from northward on either side of Hiddensee. The eastern approach is described in H. O. Pub. No. 43, Sailing Directions for the Baltic, Volume II. The northern approach consists of two channels. The western channel, the main one, is about 17 miles long from the entrance buoy westward of Hiddensee to the harbor. This channel is dredged to a depth of 16½ feet, but this depth is subject to change because of shifting sands, a condition that is brought by westerly winds; the maximum allowable draft is 13 1/2 feet (1968). The eastern channel, between Hiddensee and Rugen, is about 17 miles long and has a depth of 8 feet.

The small port or Barhöft is located on the mainland in the approach to Stralsund in a position about 2 miles southwestward of Hiddensee.

There is anchorage in Stralsunder Fahrwasser.

Water level.—In Gellenstrom, the water level is raised by winds from the north and east and lowered by winds from the south and west. Generally, the water level rises up to 2½ feet above the mean level and drops to 1¼ feet below the mean level. During very severe storms when flooding occurs, the water level may rise as much as 6½ feet above the mean level and may drop to 3¼ feet below the mean level. The maximum variation in water level recorded here

was 9 feet above and 4 feet below the mean level.

Information on the water level can be obtained from the pilot station at Barhöft.

At Stralsund, the water level is raised by northeast gales and is lowered by southwest gales. Fluctuations up to 2 feet above and below the mean water level occur frequently. During very severe gales that are accompanied with flooding the water may rise up to 7¾ feet above the mean level or may drop as much as 5½ feet below the mean level.

In the waterway eastward of Hiddensee, the water level is raised by northeast gales and lowered by southwest gales. The highest water was measured at 6½ feet above the mean level and the lowest water at 3¼ feet below the mean level. Generally, the greatest fluctuations occur during the fall, winter, and spring.

Currents.—In the main channel to Stralsund, the current sets southward with winds from the west through north to east-northeast. It sets northward with winds from the east through south to west-southwest. With light breezes the current may change direction several times during one day. Northeasterly and northwesterly gales cause the strongest southgoing currents and southwesterly and southeasterly gales cause the strongest northgoing currents.

In the waters eastward of Hiddensee, the current sets northward at a rate of up to 3 knots with winds from the west through south to east-southeast. The current sets southward at an average rate of 2½ knots with winds from the west-northwest through north to east; the rate of current may be increased to 4 or 5 knots. The current in the direction of this fairway is sometimes variable; it may be setting northward in Libben while at the same time it may be setting southward in the Trog.

Ice.—Between Barhöft and Stralsund, ice begins to form as early as the first week of November or as late as the first week of March; on

the average it forms in the middle of December. The ice may disappear as early as the middle of December or may remain as late as the first week of April; on the average it disappears during the first week of March.

In addition to the fast ice in the inner waters, drift ice brought in from the open sea under the influence of northerly winds is of concern to the mariner. At such times there is such a heavy accumulation of ice in both entrance channels that passage is difficult or even impossible. Tugs are used to keep the main fairway open as long as possible.

Stralsund harbor is closed on the average of 27 days, but during severe winters this period may be twice as long, possibly 99 days in very severe winters.

DEPTHS.—In the main channel there is a least depth of 16 1/2 feet from the sea approach westward of Hiddensee to the northern end of Stralsunder Fahrwasser.

The fairway eastward of Hiddensee has a least depth of 2.5 m (8.2 ft.).

Barhoft and the channel leading to it have a depth of 2.2 m (7.2 ft.).

In Stralsunder Fahrwasser there are depths of 3.0 to 15.0 m (9.8 to 49.2 ft.) as far as the entrance to Stralsund channel.

The short channel from Stralsunder Fahrwasser to the harbor entrance has a depth of 5.6 m (18.3 ft.). Inside the harbor, depths are 2.9 to 5.9 m (9.5 to 19.3 ft.). In 1968, the harbor was able to accommodate alongside a maximum draft of 17 feet.

6B-9 SEA APPROACH AND THE MAIN CHANNEL.—In the sea approach to the main channel, the 5-fathom curve lies approximately along the parallel of the northwest end of Hiddensee. Southward of the 5-fathom curve, the depths decrease rather uniformly except for the northern part of the extensive shoal area that extends nearly 7 miles northward from the islands on Der Bock. The main channel is entered between the northern part of this shoal area and Hiddensee.

From the sea to Stralsunder Fahrwasser, the main channel is comprised of five reaches and is about 13 miles long. It leads through Gellenstrom and Vierendehl Rinne. The entrance to the channel is marked by a lighted buoy which is moored in a depth of about

29 feet in a position about 2 3/4 miles southwestward of Dornbusch Lighthouse. The entire channel is buoyed and the fairway in the four inner reaches is indicated by range lights. Light buoys or lighted bell buoys are moored at the turns of the channel.

The critical part of the channel is in Gellenstrom and Vierendehl Rinne. Here the fairway is only about 165 feet wide at the bottom and is subject to heavy silting. Dredging is essential to maintain the depth at 16 1/2 feet.

Gellenstrom is the narrow cut that lies off the west side of the southern end of Hiddensee. Vierendehl Rinne is the cut through Vierendehl Grund, the shoal area lying southward of Hiddensee and eastward of Barhoft.

RANGE LIGHTS.—The fairway in the northern part of Gellenstrom is indicated by Zarrenzin Range Lights in line 195°; the front light of this range stands on Der Bock. The southern part of Gellenstrom is indicated by a pair of lights in range 174° that stand on the shallows of Vierendehl Grund.

The connecting fairway between Gellenstrom and Vierendehl Rinne is indicated by a pair of lights in range 225° that stand close southward of Barhoft.

The fairway in Vierendehl Rinne is indicated by two pairs of range lights in line 322°-142°. The front range stands on Bessiner Haken, located on Rugen in a position about 5 miles southeastward of Barhoft. The rear range is located on Der Bock; the rear light of this range is the front light of Zarrenzin Range.

BARHOFT is a small harbor that is used as a pilot station. A least depth of 13 1/2 feet was reported in the buoyed channel (1962). The channel which is subject to silting is maintained by dredging. Vessels should not overtake in the channel or transit it during darkness. There is a depth of about 7 feet in the harbor. There is a water level gage here. Storm signals are displayed by day and at night from a mast near the harbor. The pilot lookout tower stands on the high ground about 1/4 mile northwestward of the harbor. There is a signal station here.

CHANNEL EASTWARD OF HIDDENSEE.—This channel is entered in Libben, the water lying between the northern end of Hiddensee and Der Bug, on Rugen. It follows a circuitous

course through the deepest water in the shallows in Vitter Bodden, Trog, and Schaproder Bodden and continues southward to the northern end of Stralsunder Fahrwasser where it joins the fairway of the main channel.

Vitter Bodden is the water southward of Libben. Trog is the narrows between Fahrinsel, an islet off the east side of Hiddensee, and Seehof, located on a projecting point on Rugen. Schaproder Bodden is the expanse of water southward of Trog. Several submarine cables are laid across Trog between Seehof and Fahrinsel and a ferry crosses the channel here.

The channel is dredged to a least width of about 100 feet. It has a depth of 3.0 m (9.8 ft.) in Libben and Vitter Bodden and a depth of 10 feet in the Trog and Schaproder Bodden as far as Stralsunder Fahrwasser. The entrance is marked by two lighted bell buoys, moored about 2 1/4 miles east-northeastward of Dorbusch Lighthouse. The remainder of the channel is marked by buoys.

There are three small loading places on the east side of Hiddensee which are accessible by small channels that branch off the above-mentioned channel. Kloster and Vitte are villages in small bights in the northern part of the island. The channels leading to these two loading places leave the main channel in Vitter Bodden and lead westward of the drying sandbank between Vitter Bodden and Libben. Spars mark the channels in critical places. The loading places and the channels leading to them have a depth of 3.0 m (9.8 ft.). Neuendorf, another loading place on the east side of Hiddensee, is approached from Schaproder Bodden. This loading place has a depth of 2.5 m (8.2 ft.); the fairway in the channel is indicated by a pair of beacons in range 286 1/2° from which lights are shown occasionally.

There is a loading place at the village of Schaprode which is located on Rugen on the eastern shore of Schaproder Bodden; depths alongside are 2.5 m (8.2 ft.). There are also loading places on the west side of Rugen that are accessible through secondary chan-

nels that branch off from the channel eastward of Hiddensee. Two of these loading places are located in Kubitzer Bodden, which indents Rugen between Bessiner Haken and a point about 3 miles north-northeastward. The approach channel to these places branches off from the vicinity of the conjunction of the two channels leading to Stralsunder Fahrwasser; it has a depth of 6 feet and is marked by buoys and spars.

6B-10 STRALSUNDER FAHRWASSER is the narrow waterway that separates the southwestern part of Rugen from the mainland. From its northern entrance it leads into Greifswalder Bodden and comprises part of the eastern approach to Stralsund. The dam from Stralsund over Danholm to Rugen has a fixed bridge that spans the fairway and restricts traffic to small vessels.

Stralsunder Fahrwasser has the greatest depths of all the waters between Rugen and the mainland. There are depths of 3 1/4 to 10 1/4 fathoms between the shorebanks northward of the dam. In its northern part this waterway is about 1/2 mile wide between the shorebanks. Anchorage can be taken here.

The fairway in Stralsunder Fahrwasser is marked by lighted and unlighted buoys. It is indicated by a pair of lights in range 181° that stand in the harbor of Stralsund.

The bridge over the fairway in Stralsunder Fahrwasser has a vertical clearance of 26 feet and has two openings through which vessels may pass. Lights are shown on the bridge at the openings; two mooring buoys are located nearby, one on each side of the bridge.

A submarine cable is laid between Stralsund and Altefahr, a village on Rugen northeastward of the harbor. The direction of the cable is indicated by range beacons on each shore and by two buoys moored on the shorebank on each side of the fairway. A ferry runs between Stralsund and Altefahr.

HARBOR.—The harbor fronts the city of Stralsund and is protected by three breakwaters that extend from the mainland to Danholm. There are two entrances between

the breakwaters, the main one being the northern one. On the south side of the harbor there is another entrance for vessels approaching from Ziegelgraben. This passage is spanned by a double bascule bridge that has a horizontal clearance of 82 feet.

The berthing facilities are at the quayed waterfront of the city.

The northern entrance channel leads from Stralsunder Fahrwasser into the harbor and has a depth of about 5.6 m (18.3 ft.) over a bottom width of about 130 feet. The channel is marked by buoys and the fairway is indicated by a pair of lights in range 241° that stand on the quay in the northern part of the harbor. Lights are shown on the breakwaters on each side of the entrance.

Inside the harbor there is a channel with a depth of 6.0 m (19.6 ft.) that leads southeastward to the entrance at the bridge. The entrance to this channel is marked by two lighted dolphins, one on each side of the fairway. A lighted dolphin near the northern breakwater bearing 325° and seen between the dolphins indicates the fairway in this channel. Buoys and lighted dolphins also mark this channel.

In the southern part of the harbor there are about 15 dolphins to which vessels may moor.

There are several submarine cables in the harbor.

Traffic through the bridge is regulated by signals that are shown by day and at night. Pile fenders for guiding vessels through the opening stand at the bridge entrance. Lights are shown on the harbor side of the bridge opening.

STORM SIGNALS are shown by day and at night from a mast near the signal station in the northern part of the harbor. The signal station communicates by day only.

PILOTAGE is compulsory for vessels over 100 gross tons. Pilots board vessels during daylight hours only about 1 mile northwestward of Gellen Light. Barhoft is the pilot station and a watch is maintained at the lookout tower. In answer to a vessel's signal for a pilot, the German merchant flag is hoisted on a mast at the lookout tower to signify that the vessel's signal has been

observed. If a pilot is unable to come out the International Code signals to this effect will be made.

DIRECTIONS.—From a position off the lighted buoy moored 2 3/4 miles southwestward of Dornbusch Lighthouse, vessels should steer about 168° for Gellen Light until Zarrenzin Range comes in line 195°. Vessels should then steer in on that range to the intersection of Vierendehl Range (174°) in a position about 3/4 mile westward of Gellen Light, wherefrom they should steer in on the latter range to a position eastward of Der Bock. These two ranges lead through the northern and southern parts of Gellensstrom to the intersection of the Barhoft Range (225°) and are marked by buoys.

From the position eastward of Der Bock, vessels should steer in on the Barhoft Range until the range on Der Bock (322°) is intersected. From the latter position and with the Der Bock Range seen over the stern, vessels should steer through Vierendehl Rinne with the Bessiner Haken Range in line 142° to a position in the northern part of Stralsunder Fahrwasser about 1 mile distant from Bessiner Haken. At this position the range in Stralsund harbor will come in line 181°. Vessels should then steer in on this range, which leads through Stralsunder Fahrwasser to a position westward of Altefahr.

From the position westward of Altefahr, vessels should steer southeastward toward the opening in the bridge that spans the fairway in Stralsunder Fahrwasser until the harbor entrance range is in line 241°. This range leads into the harbor.

6B-11 STRALSUND.—The city of Stralsund lies adjacent to the harbor and has a network of canals between it and the waterfront. The population is 65,300 (1960). It is an important rail center and ship-building port. Other industries are metalworking, sugar refining, manufacture of machinery and food products, and fish processing. The principal imports are petroleum, timber, and coal. The chief exports are grain and sugar. There is a customhouse in the harbor.

Berths.—Ippenkal is located in the northern part of the harbor and just southward of the root of the northern breakwater. It is about 360 feet long and has a depth of 11 1/2 feet alongside.

Ballastkiste is a fairly large mole that projects from the waterfront and faces the northern entrance to the harbor. The northern side of the mole has a berthing length of about 600 feet with a depth of 19 1/2 feet alongside; the southern side is about 360 feet long and has depths of 15 to 19 feet and the east side is about 180 feet long and has a depth of 19 feet alongside.

Hansakai lies southward of Ballastkiste and has a length of about 550 feet with depths of 15 to 19 1/2 feet alongside.

Alter Schwedenkal, with a length of about 1,130 feet and a depth of 22 1/2 feet alongside, lies southward of Hansakai and is adjoined farther southward by Neuer Schwedenkal. The latter is about 810 feet long and has depths of 16 to 19 feet alongside.

The canals have about 2,200 feet of quayage with a depth of 6 1/2 feet alongside; barges and small craft moor at these berths. The canals are entered from the harbor between Hansakai and Alter Schwedenkal and also from the vicinity of the root of Ballastkiste. Draw and bascule bridges span the entrances and separations of the canals.

In the southern part of the harbor and also southward of the bridge there are shipyards on the mainland and on Danholm. There is a basin for fishing vessels on the mainland southward of the bridge.

All the harbor quays except Ippenkal are served by the railroad. On the quays there are cranes with capacities of 1 1/2 to 10 tons and several grain elevators. Tugs are compulsory for vessels over 400 tons, or exceeding 230 feet in length, when entering or leaving the harbor and can be ordered through the pilot office at Stralsund.

SUPPLIES.—Provisions are procurable and water is piped to the main quays. Diesel oil is available on the northern side of Ballastkiste.

REPAIRS.—The shipyards have facilities to handle major repairs. There is a drydock capable of lifting vessels up to 3,000 dead weight tons and a marine railway with a capacity of about 1,000 tons.

COMMUNICATIONS.—There is steamer communication with other Baltic ports and with places on Rugen. The city is connected with the general railroad system.

MEDICAL.—There are hospital facilities in the city.

DERATTING.—See section 1-7.

INNER WATERS OF THE MAINLAND

6B-12 Southward of the Zingst peninsula there is a series of shallow and irregularly formed bays that extend as far westward as Fischland (sec. 5D-2). The entrance to this group of bays is between Der Bock and Barhoft. From east to west the names of the bays are as follows: Der Grabow, Barther Bodden, Bodstedter Bodden, and Saaler Bodden. The loading places in these bays are Barth, located on the southern side of Barther Bodden; Zingst, located in Zingster Strom, which connects Barther Bodden with Bodstedter Bodden; Prerow, which is approached through Prerower Strom from the northern side of Bodstedter Bodden; Wieck, which lies on the northwest side of Bodstedter Bodden; Born, which is in Koppel Strom, the waterway between Bodstedter Bodden and Saaler Bodden; Wustrow, on the western side of Saaler Bodden; and Ribnitz and Damgarten, both located at the head of Saaler Bodden.

A channel with a width varying from 65 to 130 feet is dredged through these waters and the fairway in it is marked with buoys. The various loading places are accessible through this channel or channels that branch off from it. Between Barhoft and Barth, a distance of about 13 miles, there is a depth of 10 1/2 feet; between Barhoft and Damgarten, a distance of about 33 miles, there is a depth of 2.4 m (7.8 ft.). Local knowledge or the assistance of a pilot is essential to navigate these waters.

A swing bridge spans the channel between Zingster Strom and Bodstedter Bodden.

Water level.—Winds from the northwest through north to northeast generally raise the water as much as 2 feet above the mean level and southwesterly gales lower it as much as 1 foot. During severe gales the fluctuation may amount to 7 feet above and 3 feet below the mean level.

Barth is the largest loading place in these waters. The harbor fronts the town and is protected by two breakwaters; the entrance lies between the breakwater heads and faces northward. There are depths of 4 to 11 feet inside the harbor and depths of 7 to 11 feet alongside the berths.

Barth to Damgarten.—The main channel from Barth to Damgarten follows an intricate course through Zingster Strom where it passes by the loading place of Zingst. Thence it passes through Bodstedter Bodden and Koppel Strom and enters Saaler Bodden. In Bodstedter Bodden there are branching channels that lead to Prerow and Wieck. The channel to Prerow has a depth of 7 feet. In Koppel Strom a channel branches off and leads to Born. In Saaler Bodden the branch channel leading to Wustrow has a depth of 1.5 m (4.9 ft.) and the one leading to Ribnitz has a depth of 6 feet.

Bridge signals.—The bridge that spans the channel is not opened during thick weather or at night; a red light is shown from the bridge during such times. A red ball hoisted up on a staff on the bridge indicates that the bridge cannot be opened. When this ball is halfway up it indicates that the bridge will be opened, and when the ball is lowered it indicates that the vessel can pass through.

INNER WATERS OF RÜGEN

6B-13 A group of connected shallow bays intersect the northern part of Rügen and have in them several loading places. These inland bays are approached either from the sea or from Stralsunder Fahrwasser through the channel eastward of Hiddensee and are entered from Vitter Bodden. From west to east, these waters are named Rassower Strom, Wieker Bodden, Breetzer Bodden, Breeger Bodden, Lebinner Bodden, Grosser Jasmunder Bodden, and Kleiner Jasmunder Bodden.

The loading places of Wiek and Starrvitz are in the northern part of Wieker Bodden and Polchow is located on the eastern side of Grosser Jasmunder Bodden.

There are two channels leading through these bays; one leads into Rassower Strom and Wieker Bodden and the other leads through Breetzer Bodden onward to Kleiner Jasmunder Bodden. The channels are dredged to a charted depth of 3.0 m (9.8 ft.) over a width of about 100 feet and are marked by buoys and spars. The branching channels that lead to the loading places have depths of 2.2 to 2.5 m (7.2 to 8.2 ft.).

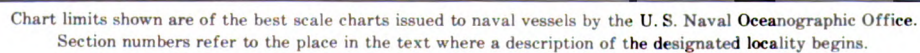
There is a ferry crossing at the western entrance of Breetzer Bodden.

Grosser Jasmunder Bodden has a spacious roadstead in which there are depths of 6.0 to 10.3 m (19.6 to 33.7 ft.). An embankment separates Grosser Jasmunder Bodden from Kleiner Jasmunder Bodden. A lock in the embankment provides access to the inner bay.

ANCHORAGES

6B-14 Eastward of Darsser Ort.—See section 6B-7.

Stralsunder Fahrwasser.—See section 6B-10.



CHAPTER 7—GRAPHIC INDEX

CHAPTER 7

SMAALANDS FARVANDET

Part A. Western Part of Smaalands Farvandet

Part B. Guldborg Sund

Part C. Eastern Part of Smaalands Farvandet

Plan.—This chapter describes Smaalands Farvandet and its entrances from Store Bælt and the Baltic Sea. The description begins with the western entrances, and it continues with the western part of Smaalands Farvandet. Guldborg Sund is then described. The description concludes with the eastern part of Smaalands Farvandet. The arrangement is eastward from Store Bælt through the western part of Smaalands Farvandet and southward in Guldborg Sund from its northern entrance. In the eastern part of Smaalands Farvandet the arrangement is in the direction of the passages from their western ends to the Baltic entrances.

GENERAL REMARKS

7-1 Smaalands Farvandet comprises the waters between Sjælland on the northern side and Lolland and Falster on the southern side. It connects Store Bælt with the Baltic Sea by means of the passages between Falster and Lolland, between Falster and Møn, and between Møn and Sjælland. The western limit of Smaalands Farvandet is defined in section 2-1, and the southern and eastern limits are the outer entrances of the channels in these waters which lead to the Baltic Sea. Smaalands Farvandet is considered as being divided into a western part and an eastern part by the meridian of $11^{\circ}50'$ E. This meridian, which passes through Orehoved, the northern extremity of Falster, is about 24 miles eastward of the western limit of Smaalands Farvandet.

The principal entrances to Smaalands Farvandet from Store Bælt are Agersø Sund, between Egholm and Agersø on the west and Sjælland on the east; Omø Sund, between Agersø and Omø; and the channel between Omø Staalgrunde and the northern side of Lol-

land. There are also channels between Omø Tofte and Omø Staalgrunde, and there is one across Omø Tofte. Agersø Sund and Omø Sund are both deep and can be used by vessels of any size, but the channels between Omø and the north coast of Lolland are suitable only for small vessels.

The western part of Smaalands Farvandet is wide throughout most of its length, but it narrows considerably near its eastern limit. The coasts on both sides have numerous indentations. A few islands are located close to the Sjælland coast, and several islands lie within about $6\frac{3}{4}$ miles of the northern side of Lolland. The main fairway extends through the middle of Smaalands Farvandet from the western entrance channels to the western part of the passage between Sjælland and Falster. This fairway has general depths of 5 to 10 fathoms, but there are numerous shoals and patches with depths of less than 5 fathoms in it. Secondary channels lead from the western entrances to the ports of Bandholm and Sakskøbing, on the northern side of Lolland, and to the northern

entrance of Guldborg Sund. There are also channels for small vessels between some of the islands and shoals.

In the fairway of Guldborg Sund, the passage between Lolland and Falster, the least depth from the northern entrance to the port of Nykøbing, on the western side of Falster, is 20 feet, but thence southward to the Baltic Sea the greatest depth that can be relied on is only 6½ feet.

The eastern part of Smaalands Farvandet is relatively shallow except in some portions of the channels. Immediately eastward of the meridian of 11°50' E. the main fairway from the western entrances divides into two passages, each of which comprises several sections with different names. The northern passage leads along the coast of Sjælland and thence north-westward of Møn; a vessel can pass through it between the western part of Smaalands Farvandet and the Baltic Sea in a least depth of 8½ feet. The southern passage leads along the north coast of Falster and between that island and the southwestern part of Møn. A channel with a normal depth of 16 feet leads through the Baltic entrance of this passage, but a somewhat greater depth can be carried through the remainder of the passage. The southern passage is lighted and is the only one of the three connecting the western part of Smaalands Farvandet with the Baltic Sea that can be navigated at night.

There are several minor ports in the area described in this chapter. Those having approaches and berthing facilities with depths of 19 feet or more are Næstved, on the southern side of Sjælland; Nykøbing, on the western side of Falster; Masnedsund, at the western end of the northern passage through the eastern part of Smaalands Farvandet; and Stubbekøbing, on the north coast of Falster. Vessels requiring depths greater than 16 feet can approach the harbors in these waters only from westward.

Caution.—NEMEDRI should be consulted for information concerning danger areas, special routing, temporary navigational aids, and related subjects. NEMEDRI supersedes any "Directions" given in this chapter. See also section 1-41.

TIDES AND WATER LEVEL

7-2 The tidal range in Smaalands Farvandet is small, but strong winds may raise or lower the water level a considerable amount. Local variations in the water level are given with the descriptions of the places concerned.

CURRENTS

7-3 During fine, calm weather there are regular tidal currents in Smaalands Farvandet which set eastward with a rising tide and westward with a falling tide. When the weather becomes unsettled, the direction of the current is determined by the wind. Northerly and westerly winds cause an eastgoing current, and easterly and southerly winds cause a westgoing current. In the narrow channels in the eastern part of Smaalands Farvandet the currents sometimes attain a velocity of 3 to 4 knots, but in the western part of these waters they seldom exceed a rate of 1 knot except in some of the coastal indentations.

WINDS AND WEATHER

7-4 See section 1-50.

ICE

7-5 Ice may appear in Omø Sund and the deeper fairways in the western and southwestern parts of Smaalands Farvandet as early as the third week of December, and it may remain as late as the second week of April. See table 5 in chapter 1. Among the islands off the north coast of Lolland ice forms quickly and often remains for a long time. The coast of Sjælland in the vicinity of Karrebæksminde (sec. 7A-16) may be rapidly obstructed by ice or cleared of it by a shift in the direction of the wind.

In the eastern part of Smaalands Farvandet the relatively shallow channels of the northern passage to the Baltic Sea usually freeze over early in the season, and once ice has formed here it is slow to disappear. A large amount of drift ice may be carried in both directions through the passage which leads between Falster and Møn, but the channel is seldom entirely frozen over.

General ice information is given in Chapter 1.

PILOTAGE

7-6 Pilots stationed on the northern side of the entrance of Skælskør Fjord will take vessels through the western part of Smaalands Farvandet to Masnedø, and to Nyborg, Korsør, and Albuen in Store Bælt. Pilots stationed at Karrebæksminde will take vessels to Næstved, Guldborg, and Grønsund in Smaalands Farvandet, and also to Nyborg and Korsør. Pilots for the southern channels of the western part of Smaalands Farvandet are stationed at Bandholm and Oreby. Vessels intending to enter Guldborg Sund from southward can obtain pilots from Nysted. Vessels entering Smaalands Farvandet from the Baltic Sea through Grønsund, the southeastern section of the passage between Falster and Møn, can obtain pilots from Masnedø.

Further information concerning pilotage in Smaalands Farvandet and its entrances is given with the detailed descriptions of the various channels and ports.

See also section 1-37.

Part A. WESTERN PART OF SMAALANDS FARVANDET

7A-1 Korsør Church ($55^{\circ}20' N., 11^{\circ}08' E.$) and Klinteodde, the eastern entrance point of Onsevig, mark the northern and southern ends of the imaginary line separating Smaalands

Farvandet from Store Bælt and are described in sections 2B-8 and 2C-8, respectively. Egholm, Agersø, Omø, and the dangers lying between these islands and the main fairway of Store Bælt are described in section 2B-5. The principal dangers and channels between Omø and the northwestern part of Lolland are described in section 2C-7.

GENERAL REMARKS

7A-2 The coast of Sjælland between Korsør and Ferne Klint, about $9\frac{1}{2}$ miles southeastward, form the northeastern and eastern sides of Agersø Sund and its approach from Store Bælt. Eastward of Egholm this coast is indented by Skælskør Fjord, at the head of which is the town and harbor of Skælskør. From Ferne Klint the general trend of the coast is eastward for about 12 miles to Karrebæksminde, at the entrance of Karrebæk Fjord; a dredged channel leads from the fjord entrance to the harbor at Næstved, about $4\frac{1}{2}$ miles northeastward of Karrebæksminde. The coast trends southeastward from Karrebæksminde for about 10 miles to the inner end of Knudshoved, a narrow peninsula which projects nearly 8 miles west-northwestward. Karrebæksminde Bugt is the water area lying northward and northwestward of the outer end of Knudshoved. The meridian forming the eastern limit of the western part of Smaalands Farvandet crosses the Sjælland coast at the inner end of Knudshoved.

The north coast of Lolland trends in a general easterly direction from Klinteodde for about 5 miles to a position nearly $3\frac{1}{4}$ miles northeastward of Utterslev Church (sec. 2C-8) and then turns southeastward for about $4\frac{1}{4}$ miles to Kragenæs Havn. Between Kragenæs Havn and the northern extremity of Vignæs, a peninsula lying about $9\frac{1}{2}$ miles eastward, the coast recedes southward and forms a bight with an irregular shoreline. The port of Bandholm is located in the southern part of this bight and about $6\frac{1}{2}$ miles southeastward of Kragenæs

Havn. Sakskobing Fjord, the outer part of which lies eastward of the harbor of Bandholm, indents the coast in a southeasterly direction; the town and harbor of Sakskobing are situated at the head of the fjord.

A peninsula on the northwestern side of Falster lies with its western extremity about 3 miles northeastward of the northern extremity of Vigsnaes; between the two peninsulas is the northern entrance of Guldborg Sund. Orehoved, which marks the dividing line between the western and eastern parts of Smaalands Farvandet, is located nearly 2 1/2 miles eastward of the northern extremity of the peninsula on the northwestern side of Falster.

The principal islands in the southern half of the western part of Smaalands Farvandet are Vejro, Raago, Skalo, Fejo, Lilleo, Askø, and Femo, all of which are inhabited. Those nearest the main fairway are Vejro, which lies from 6 1/2 to 7 1/2 miles northward of Kragenaes Havn, and Femo, which is located about midway between Vejro and the northern entrance of Guldborg Sund.

The entrance channels from Store Bælt lead into an area with depths of 5 to 16 fathoms which is centered about midway between Agerso and Vejro. From this area the main fairway passes northward of Vejro and Femo and southward of Knudshoved to Masnedsund and Storstrom, the western sections of the northern and southern passages, respectively, in the eastern part of Smaalands Farvandet. Masnedsund can be approached from westward in depths of not less than 23 feet, and Storstrom can be approached from the same direction in depths of not less than 19 feet. A channel with a least depth of 21 feet leads from the main fairway to the northern entrance of Guldborg Sund, passing eastward of Femo.

Staal dyb, the channel between the shorebank extending from Lolland on the southwest and the flats extending from Skalo and Fejo on the northeast, is entered about 3 miles westward of Vejro. After the channel has

passed southwestward of Fejo, it continues in a general southeasterly direction as Lindholm Dyb and terminates about 2 miles north-northwestward of the harbor at Bandholm. Dredged channels lead from the southeastern end of Lindholm Dyb to Bandholm and Sakskobing. Staal dyb can be approached from northward through a deep channel westward of Vejro, and it can be approached from westward through the passage southward of Omo Staalgrunde (sec. 2C-7). Vessels can proceed from the northwestern entrance of Staal dyb to Bandholm and Sakskobing in depths of not less than 19 and 14 feet, respectively.

Only those dangers which lie in or near the principal fairways and anchorages are described in this chapter part.

CURRENTS

7A-3 See section 7-3.

ICE

7A-4 See section 7-5.

WESTERN ENTRANCES OF SMAALANDS FARVANDET

7A-5 AGERSO SUND.—The northernmost channel leading from Store Bælt into Smaalands Farvandet is that through Agerso Sund, the passage between Egholm and Agerso on the west and Sjaelland on the east. The fairway in the sound and its northern approach has depths of 6 to 36 fathoms between the shorebanks and detached shoals lying on both sides.

The currents in Agerso Sund do not change regularly, but they vary according to the direction of the wind. Winds from northeast through south to west cause a northgoing current, and winds from west and northwest cause a southgoing current.

The approach to Agerso Sund from the main fairway of Store Bælt fronts the Sjaelland coast between Korsør (sec. 2B-9) and a point lying about 4 1/2 miles south-eastward. The land bordering this approach

rises gradually inland to a height of about 150 feet. Korsor Skov, about 1 1/2 miles southeastward of Korsor, and Klarskov, about 3/4 mile farther southeastward, extend down to the coast. At several places along the coast there are bluffs, one of the most conspicuous being Alehoj, 46 feet high, which is located about 1 1/4 miles southeastward of Badstue Pynt (sec. 2B-8).

Prominent landmarks in addition to those described with the approach to Korsor in section 2B-8 are Bonderup Farm, which is situated about 1 mile eastward of Alehoj and has a white main building; Boeslunde Church which is located about 2 3/4 miles east-south-eastward of Bonderup Farm; and Espe Manor, which stands about 1 mile southwestward of Boeslunde Church and is partly surrounded by woods. Southward of Espe Manor the coast becomes lower.

The 6-fathom curve lies up to 1 1/4 miles off this stretch of coast, and is close to the 10-fathom curve, outside which is a vein of deep water that varies in width from about 200 yards to 1/2 mile and has depths of 16 to 22 fathoms. Southeastward of Badstue Rev (sec. 2B-8) the shorebank within the 3-fathom curve narrows to a width of less than 1/4 mile southwestward of Alehoj, but a tongue projects about 3-4 mile southwestward of Alehoj, but a tongue projects about 3/4 mile southward from that bluff. Several patches with depths of 4 1/2 to 5 1/2 fathoms lie within a distance of 2 miles westward and west-southwestward of Alehoj. The depths within about 1 mile of the coast between Korsor Skov and Espe Manor are irregular. A detached shoal with a least depth of 2 3/4 fathoms lies southwestward of Klarskov and about 3/4 mile offshore. Lindeskov Flak, with depths of less than 3 fathoms over a bottom of sand and stones, extends about 1 mile from the coast between positions about 1/2 mile south-southwestward and 1 1/2 miles southward of Espe Manor.

On the southern side of the approach to Agerso Sund from Store Baelt are Egholm Flak, its northwestern and northeastern ex-

tremities marked by buoys, and a shoal lying about 2 1/2 miles northwestward of Egholm. These dangers are described in section 2B-5.

The 6-fathom curve northward of Egholm Flak is nearly 2 1/4 miles north-northwestward and 1 1/4 miles northeastward of the northern extremity of Egholm. The 10-fathom curve on the southern side of the deep channel lies about 2 1/2 miles north-northwestward of Egholm, and it lies close to the 6-fathom curve off the northeastern extremity of Egholm Flak.

The eastern side of Agerso Sund between the point about 4 1/2 miles southeastward of Korsor and the entrance of Skaelskor Fjord, about 1 1/2 miles southward of the point, recedes slightly, forming a bight. Stigsnaes, the peninsula between Skaelskor Fjord and the extreme western part of the south coast of Sjaelland, forms the eastern side of the sound from the fjord entrance to Ferne Klint, about 3 1/2 miles south-southeastward. Gedehave, the northwestern part of Stigsnaes, terminates in a steep yellow cliff. Ornehoved, the extremity of a projection on the western side of Stigsnaes, lies about 1 1/2 miles southward of the northern extremity of Gedehave. Immediately within Ornehoved is Stigsnaes Skov; the coast southeastward of this wood consists mainly of yellow cliffs. Ferne Klint, situated on the northeastern side of the southern entrance of Agerso Sund, is a small but conspicuous yellow cliff.

Some of the prominent objects within the coast on the eastern side of the sound are Skaelskor Church, about 1 3/4 miles east-northeastward of the northern extremity of Gedehave; a chimney standing about 3/4 mile westward of Skaelskor Church; Borreby Castle, about 2 miles east-northeastward of Ornehoved; and Magleby Church, a white structure located about 1 mile eastward of Borreby Castle.

7A-6 EGHOLM (55° 15' N., 11° 11' E.) and AGERSO, which with the exception of Agerso Havn are described in section 2B-5, lie on the western side of Agerso Sund and about 1 1/2 miles off the Sjaelland coast. Agerso Havn is described in section 7A-7.

The fairway through the sound is entered from northward between the 6-fathom curves that lie outside Lindeskov Flak and the northeastern extremity of Egholm Flak, respectively. The vein of deep water mentioned in the description of the northern approach continues through the sound, the greatest charted depth in it being 36 fathoms eastward of Egholm.

The shorebank inside the 3-fathom curves on both sides of Agerso Sund extend considerable distances offshore in places. Tusehage (Tudsehage), the portion of the shorebank fronting the entrance of Skaelskor Fjord, extends about 3/4 mile northwestward from Gedehave; some drying rocks lie on its inner part. The northwestern extremity of Tusehage is marked by a can buoy. In the entrance of Skaelskor Red, a bight in the shorebank between Lindeskov Flak and Tusehage, is a 4 1/4-fathom patch lying about 1 1/3 miles northwestward of the northern extremity of Gedehave, and in the bight are two 3-fathom patches lying about 1 mile northwestward and north-northwestward of the same point.

Between Gedehave and Ornehoved the shorebank extends from 1/2 to 1 mile offshore. There are depths of less than 3 feet within a distance of 1/2 mile northward and 1 1/3 miles westward of Ornehoved; rocky patches with depths of 1 1/2 to 2 fathoms lie just inside the 3-fathom curve west-southwestward and southwestward of that point. A can buoy marking the edge of the shorebank off Ornehoved is moored in a depth of 5 fathoms about 1/2 mile westward of the point.

The shorebank between Ornehoved and a point lying about 1 1/3 miles southeastward is fairly narrow and steep-to, but it widens southeastward of the latter point and extends

nearly 1 mile south-southwestward from Ferne Klint.

On the western side of Agerso Sund the eastern edge of Egholm Flak trends southward from its northeastern extremity, which lies about 1 1/2 miles northward of the eastern point of Egholm, to a position about 200 yards eastward of the same point. Thence the edge of the shorebank extending from Egholm and Agerso continues in a general southerly direction to a position just over 1/3 mile eastward of the church in Agerso village (sec. 2B-5), passing close outside the entrance of Bøgevig, a shallow bay lying between Egholm and the northern part of Agerso.

Flats with depths of less than 3 fathoms extend considerable distances eastward and southeastward from the southern part of Agerso. Osterhoved Flak borders the coast between Agerso village and Helleholm (sec. 2B-5) and terminates eastward at a position nearly 1 mile east-northeastward of the latter. There are depths of less than 1 fathom on the inner part of this flat up to a distance of over 1/2 mile offshore, and patches with depths of 1 to 1 1/2 fathoms lie just within the 3-fathom curve. Helleholm Flak, a continuation of Osterhoved Flak and the shorebank on the southwestern side of Agerso, extends nearly 2 miles southeastward from Helleholm; it consists of sand and mud and has rocks on its inner part.

A conical buoy with a reflector marks the eastern side of a 1 1/2-fathom patch lying close north-northwestward of the eastern extremity of Osterhoved Flak and nearly 1 mile east-northeastward of Helleholm. The southeastern and southwestern extremities of Helleholm Flak are marked by a conical buoy and a can buoy, respectively. A spar buoy is moored in a depth of 2 1/4 fathoms on Helleholm Flak in a position about 1 mile southeastward of Helleholm.

The shorebank on the western side of Agerso Sund is mainly steep-to from the northeastern

extremity of Egholm Flak to the eastern extremity of Osterhoved Flak, but thence along the eastern and southern sides of Helleholm Flak the depths change gradually.

Two submarine cables are laid across Agerso Sund between Agerso Havn and Stigsnaes Ferry Harbor. A third cable crosses the channel about 1/2 mile farther southward. Lighted beacons on Agerso and Stigsnaes indicate the direction of the southernmost cable.

Anchorage.—Small vessels can anchor southwestward of Espe Manor in depths of 4.7 to 5.6 m (2.5 to 3.0 fm) between Lindeskov Flak and the shorebank northeastward. Winds between southwest and northwest may raise some sea in this anchorage.

The best anchorage in Agerso Sund for small vessels is on the shorebank along the eastern side of the sound between Gedehave and Ornehoved in depths of 3.1 m (10.1 ft.). This anchorage has good holding ground and is safe in all winds.

There is anchorage off Bogevig in 5 to 6 fathoms between the deep channel and the shorebank on the western side of the sound. Small vessels can anchor on the shorebank abreast the southern extremity of Egholm.

7A-7 Skaelskor Fjord.—The entrance of Skaelskor Fjord is between Gedehave and a point lying nearly 1/4 mile northward. From its entrance the fjord extends nearly 1 1/4 miles in a general east-southeasterly direction to Slagternaese, a point on the northern side, and then turns northeastward for a similar distance to its head, where are situated the town and harbor of Skaelskor. Northward of Skaelskor is Skaelskor Nor, a fairly extensive, shallow body of water which is connected with the fjord by a narrow passage.

A short breakwater projects west-northwestward from the northern entrance point of the fjord, and a breakwater about 1/4 mile long extends north-northwestward from the

northern extremity of Gedehave. The entrance is approached from the southeastern part of Skaelskor Red by a narrow channel which leads close along the eastern side of the southern breakwater and thence continues through the fjord to the harbor at Skaelskor. The depth throughout this channel, which is marked by spar buoys and perches in accordance with the Danish uniform system, is 14 3/4 feet. Except in the channel the fjord is very shallow. Two light beacons stand on Gedehave and in range 156° lead through the entrance channel.

A notice cautioning vessels against proceeding at excessive speed is displayed on the head of the southern breakwater.

The tidal currents in the fjord are strong, at times attaining a rate of 5 knots. In settled weather they change direction regularly about every 6 hours, but in stormy weather a current may set in the same direction for a long period.

A pier projects from the northern side of the fjord about 1/3 mile southeastward of the northern entrance point. The head of this pier is 46 feet wide and has a depth of 14 1/2 feet alongside. Eastward of the pierhead is a row of piles to which vessels can make fast. Northerly gales may raise the water level 4 feet, and southerly gales may lower it 2 feet.

PILOTS are stationed on the northern side of the entrance. In addition to taking vessels in and out of the fjord, these pilots will undertake pilotage in the western part of Smaalands Farvandet and in Store Baelt. Because of the narrow channel and the strong currents it is inadvisable to navigate Skaelskor Fjord without a pilot. See also section 7-6.

SKAELSKOR.—The harbor of Skaelskor comprises the southwestern part of the passage connecting Skaelskor Nor with the head of Skaelskor Fjord. The principal divisions of the harbor are an outer basin with depths of 3.8 to 4.6 m (12.4 to 15.0 ft.) and an inner basin with depths of 2.0 to 3.8 m

(6.5 to 12.4 ft.). A basin for small craft lies immediately southwestward of the outer basin and has a depth of 2.5 m (8.2 ft.). Several piers and wharves for small craft are located on the northern side of the harbor opposite the outer basin.

Winds between northwest and northeast may raise the water level 3 feet, and those between southeast and southwest may lower it 2 feet. The current conditions in the harbor are similar to those in the fjord. Ice may appear in both the harbor and the fjord as early as the beginning of November, and it may remain through the first week of April.

The outer basin has three quays with lengths of 260, 230, and 165 feet, respectively, and depths of 3.8 to 4.6 m (12.4 to 15.0 ft.) alongside. About 600 feet of the quays in the inner basin has a depth of 3.8 m (12.4 ft.) alongside, and the remainder has depths alongside of 2.0 to 3.0 m (6.5 to 9.8 ft.). A tug is available.

The town of Skaelskor is situated on both sides of the harbor. The population was about 3,398 in 1965. Provisions, water, and small amounts of coal and petroleum products can be obtained. There is a machine shop and a foundry. Railroad communication is maintained with other parts of Denmark.

AGERSO HAVN.—About midway along the east coast of Agerso and close eastward of the village is Agerso Havn, a small artificial harbor. It is protected by two L-shaped breakwaters and has an entrance facing eastward. Depths in the harbor are 2.8 m (9.1 ft.) and 3.0 m (9.8 ft.) in an adjacent ferry slip. Northeasterly winds may raise the water level up to 4 feet, and southwesterly winds may lower it the same amount. A light is shown on the head of the northern breakwater. Water and some provisions can be obtained. A small machine shop is available.

A ferry operates between Agerso Havn and Stigsnaes Ferry Harbor, located on the eastern shore of Agerso Sund.

STIGSNAES OIL PIER (Gulfhavn), located about 1 mile southeastward of Stigsnaes Ferry Harbor, is a T/head pier with 4 berths. Depths alongside are: Berth 1, 15.0 m (49.2 ft.); Berth 2, 10.5 m (34.4 ft.); Berth 3, 7.5 m (24.6 ft.); and Berth 4, 4.5 m (14.7 ft.). Two lights are shown from the head of the pier. Anchorage is available off the pier in depths of 15.0 m (49.2 ft.). A pilot is stationed at the oil pier. Vessels requiring a pilot should give at least 24 hours notice. Pilots board at Halsskov Rev Light Vessel (sec. 2B-1) or at a position 1 1/2 miles southward. The pilot boat is equipped with

radio-telephone. No. tugs are available at the pier but may be obtained on 24 hours notice. Water and bunkers are available. The out-going and incoming tidal streams flow parallel to the pier head, and attain a maximum rate of 2 knots.

DIRECTIONS FOR AGERSO SUND.—The deep channel through Agerso Sund is marked by four lighted ranges. From northward the entrance reach from Osterrenden (sec. 2B-2) leads between Egholm Flak and the shorebank along the Siaelland coast. Range lights, in line 110°, located at Lindeskov about 3 miles east-northeastward of the northern extremity of Egholm mark the entrance range. Gedehave range bearing 139° 30' marks the second reach. Helleholm range lights in line 173° 30', located eastward of Helleholm Light (2B-5) mark the third reach. Egholm range lights, located on Egholm and bearing 321° astern, mark the fourth reach leading between Helleholm Flak and the shorebank extending southward from Ferne Klint (sec. 7A-5). When Helleholm rear range light bears 284° 30' after course to 167° and thence out of the sound.

7A-8 OMO SUND.—The fairway through Omo Sund, the passage between Agerso and Omo (sec. 2B-5), has depths of over 19.0 m (10.3 fm) and is the main entrance to Smaalands Farvandet from Store Baelt.

Agerso Flak, which lies westward of Naebbet, the southwestern extremity of Agerso, and Omo Nordvest Flak, which extends from the northwestern side of Omo, are described in section 2B-5.

The shorebank within the 3-fathom curve extends up to nearly 1/3 mile from the southwestern side of Agerso and is mainly steep-to. For about 1 1/2 miles south-southeastward of Helleholm the northeastern side of the fairway through the sound is bordered by Helleholm Flak (sec. 7A-6).

A spit with depths of less than 6 feet extends nearly 1/2 mile north-northeastward from the northern extremity of Omo.

Submarine cables cross Omo Sund from the northeastern extremity of Omo to Helleholm and a point about 3/4 mile northwestward on Agerso. Range beacons on the shore indicate the directions of the cables.

On the eastern side of Omo the shorebank extends up to 1/2 mile from the coast between the northern extremity of the island and Skovbanke (sec. 2B-5). An elongated shoal on which are depths of 5.0 to 5.9 m (2.7 to 3.2 fm) lies between positions about 1 mile northeastward and 1 1/4 miles eastward of the southern extremity of Omo. There

are depths of less than 6 fathoms for about 1 1/4 miles east-southeastward of Skovbanke and 2 miles eastward of the southern end of Omo. Between the 6-fathom curve eastward of Omo and the deep channel in the south-eastern approach to Omo Sund there are several patches with depths of 4 1/2 to 5 1/4 fathoms.

An unmarked wreck with a depth of 6 1/4 fathoms lies about 2 1/4 miles east-south-eastward of the southern extremity of Omo.

Buoys marking Agerso Flak, Omo Nordvest Flak, and Helleholm Flak are described with these dangers. A conical buoy with a reflector marks the outer end of the spit that extends north-northeastward from the northern extremity of Omo.

AGERSO RANGE LIGHTS, consisting of a rear light and two front lights, are shown on the southwestern extremity of Agerso. The rear light in range 328° with the eastern front light leads through the southeastern part of Omo Sund. The rear light in range 332° with the western front light leads from a position in the fairway abreast Helleholm Light (sec. 2B-5) to a position about 3/4 mile west-northwestward of the same light. The purpose of the western range is to prevent a vessel from approaching the Agerso shorebank too closely before altering course westward to enter Store Baelt.

OMO LIGHT (55° 10' N., 11° 08' E.), shown on the western extremity of Omo, is an aid to navigation in Smaalands Farvand as well as in Store Baelt. See also section 2B-5.

Two submarine cables are laid across Omo Sund between Helleholm and the northern extremity of Omo. Another cable crosses the channel about 1/2 mile farther northward. Beacons marking the landing places indicate the directions of the cables.

ANCHORAGE for small vessels can be obtained in depths of 3 to 4 fathoms about 1/4 mile off the eastern side of Omo and east-southeastward of the village in the middle of the island.

DIRECTIONS FOR OMO SUND.—A vessel entering Omo Sund from westward should

steer for Helleholm Light on the bearing 104°, which leads southward of Agerso Flak and northward of the buoy marking the northern extremity of Omo Nordvest Flak. When southward of Naebbet, the vessel should gradually turn southeastward and proceed through the remainder of the channel with the light structures on the southwestern extremity of Agerso in range astern. The western range (332°) should be held until the vessel is nearly abreast Helleholm Light, and thence the eastern range (328°) should be followed until well past Helleholm Flak.

At night, a vessel can pass through Omo Sund with the aid of the white sector of Helleholm Light and Agerso Range Lights. As the light sector intersects the range lines close to the edge of the shorebank extending from the southwestern side of Agerso, the turn southeastward should be made in sufficient time to keep clear of the bank.

ENTRANCES TO SMAALANDS FARVANDET BETWEEN OMO AND LOLLAND.—See section 2C-7.

NORTHERN SIDE OF THE MAIN FAIRWAY

7A-9 The main fairway through the western part of Smaalands Farvand is bounded on the north by the south coast of Sjaelland between Ferne Klint (sec. 7A-5) and the eastern extremity of Glaeno, about 6 1/2 miles eastward; thence by an imaginary line from the latter point to the western extremity of Knudshoved; and thence by the southern side of Knudshoved to the meridian of 11° 50' E.

From Ferne Klint to Bisserup, about 7 miles eastward, the southern side of Sjaelland is fronted by some low, narrow strips of land and by Glaeno, which rises to a height of 85 feet and has steep yellow bluffs. Within this outer coast is a shallow lagoon that is navigable only by small craft. Both Basnaes Nor, the part of this lagoon which lies westward of Glaeno, and Holsteinborg Nor, the part which lies northward and eastward of the same island, have (continued on next page)

entrances from the fairway. Ormø, a conspicuous wooded islet, lies close off the northeastern extremity of Glænø.

The main building of Basnæs Manor, which is situated on the northern side of Basnæs Nor and about 2 miles east-northeastward of Ferne Klint, has a small red tower and is partly concealed by trees. Ørslev Church, a white structure with a stepped gable, stands about $2\frac{1}{4}$ miles east-northeastward of Basnæs Manor. Holsteinborg Castle, surmounted by two slender spires, is located on the northeastern side of Holsteinborg Nor and about 2 miles east-southeastward of Ørslev Church; close eastward of the castle are woods extending inland from the shore of the lagoon. Other landmarks visible from the fairway off this part of the coast are given in the description of Agersø Sund in section 7A-5.

Bisserup Pier, located on the eastern side of the entrance of Holsteinborg Nor and about $1\frac{1}{4}$ miles southeastward of the castle, has a depth of 9 feet at its head. A dredged channel with a depth of 4 feet leads to this pier from Bisserup Vestre Red (sec. 7A-15).

The coast eastward of Bisserup is described in section 7A-15.

Knudshoved (*western extremity, 55°05' N., 11°37' E.*) is a narrow peninsula extending about 8 miles west-northwestward from that part of Sjælland which is adjacent to the eastern limit of the western part of Smaalands Farvandet. About 2 miles east-southeastward of the extremity of Knudshoved is Draget, a very narrow, low neck which sometimes covers at high water. The part of the peninsula lying westward of Draget consists of hillocks with level ground between them; the part eastward of the neck is cultivated. There are woods near the middle and at the inner end of Knudshoved.

Prominent landmarks near the inner end of Knudshoved are Kastrup Church, which is white with stepped gables and is located about 2 miles eastward of the inner end of the penin-

sula; a building with a small, slender spire at Rosenfelt, a manor situated about $1\frac{1}{4}$ miles south-southwestward of Kastrup Church; Vordingborg Church, a red structure standing about 1 mile east-southeastward of Rosenfelt; Valdemars Tower, which has a pointed roof and stands close east-southeastward of Vordingborg Church; and Ore Lighthouse, about $1\frac{1}{4}$ miles westward of Vordingborg Church.

Farther eastward are Blaabjerg, a high wooded hill which is located about $3\frac{3}{4}$ miles north-northeastward of Vordingborg Church and is conspicuous from both westward and eastward; and Kulsbjerge, a small chain of hills, the highest of which rises to an elevation of 351 feet and is located about $3\frac{1}{4}$ miles eastward of Valdemars Tower.

7A-10 Depths and dangers.—The deep channels through Agersø Sund and Omø Sund join about 3 miles southeastward of Helleholm, and from their junction a narrowing vein of deep water continues in a southeasterly direction to a position about $5\frac{3}{4}$ miles south-southeastward of Ferne Klint.

The 6- and 3-fathom curves lie up to $2\frac{1}{2}$ and $1\frac{1}{2}$ miles, respectively, off the coast between Ferne Klint and Bisserup. These curves and the depths within them are very irregular. The bottom on the shorebank to the 3-fathom curve is sand, with occasional stones.

A flat with a least depth of $3\frac{1}{2}$ fathoms lies about $1\frac{1}{2}$ miles southward of Ferne Klint and just outside the southern entrance of Agersø Sund; it consists of sand and stone. A wreck with a depth of $5\frac{1}{2}$ fathoms lies immediately westward of the northwestern extremity of this flat and about $1\frac{1}{2}$ miles south-southwestward of Ferne Klint.

Kirkegrund lies about $5\frac{1}{2}$ miles south-southeastward of Ferne Klint and is the outermost of a chain of shoals and rocky patches that extends nearly 10 miles west-northwestward from Knudshoved. It has general depths of $2\frac{3}{4}$ to $5\frac{1}{2}$ fathoms, but a rock with a depth of

only 3 feet lies on its southeastern part in a position about 8 1/4 miles west-northwestward of Knudshoved. A buoy is moored in a depth of 6 1/2 fathoms nearly 1/4 mile south-southeastward of this rock.

A patch with a least depth of 3 1/4 fathoms lies close eastward of the northeastern extremity of Kirkegrund and about 4 1/4 miles south-southwestward of the highest part of Glaeno. Eastward of this patch and about 4 1/4 miles southward of the same elevation on Glaeno is a patch with a least depth of 3 3/4 fathoms. A 2 1/4-fathom patch lies nearly 1/2 mile east-northeastward of the southeastern extremity of Kirkegrund and about 4 miles north-northeastward of Vejro (sec. 7A-11). A patch with a least depth of 4 fathoms and one with a depth of 5 1/4 fathoms lie respectively about 2 1/2 miles north-northeastward and nearly 3 1/4 miles northeastward of the same island.

VENEGRUNDE, about midway between Kirkegrund and Knudshoved, comprises several flats and patches which have depths of 2 feet to 3 fathoms, and which are separated by narrow channels with depths of 3 1/4 to 6 fathoms. The northern flat has a least depth of 1 fathom near its eastern end, and its northeastern side is marked by a conical buoy. The southwestern flat has a least depth of 2 feet, and its southern side is marked by a can buoy; there are depths of less than 5 1/2 fathoms for about 1 mile westward of this flat. The southeastern flat has a least depth of 5 feet. All the shoalest parts of Venegrunde are rocky. A wreck with a depth of 5 1/4 fathoms lies on the southern side of Venegrunde in a position about 4 1/2 miles westward of Knudshoved.

KNUDSHOVED REV, on which are depths of less than 3 fathoms, extends nearly 2 miles west-northwestward from the extremity of Knudshoved. There are numerous rocks on its inner part; its outer part consists of several rocky patches with depths of 1 to 2 3/4 fathoms. The western extremity of Knudshoved Rev is marked by a can buoy.

A rocky patch with a least depth of 1 3/4 fathoms lies between Knudshoved Rev and Venegrunde in a position about 2 1/3 miles west-northwestward of Knudshoved. Between this patch and Knudshoved Rev is a channel which has a width of about 1/4 mile and a least depth of 5 1/4 fathoms.

The shorebank extending from the southern side of Knudshoved to the 3-fathom curve is 1/4 to 1/2 mile wide for about 3 miles east-southeastward from the extremity of the peninsula, and outside this part of the shorebank are several patches having depths of 3 fathoms or less within a distance of 1 1/2 miles offshore. Knudsskov Rev, a rocky, hook-shaped projection of the shorebank, extends nearly 1 mile from the southern side of the middle part of Knudshoved. The southern side of Knudsskov Rev is marked by a can buoy moored in a depth of 4 fathoms.

FIRING PRACTICE with machine guns and small arms is carried out occasionally in an offshore direction from a range at the inner end of Knudshoved. The danger area off the coast is marked by several black spar buoys. During firing exercises a ball is displayed on a signal mast at the range. Anchoring is prohibited in the danger area, and vessels are cautioned against passing through it while firing is in progress.

SOUTHERN SIDE OF THE MAIN FAIRWAY

7A-11 The main fairway is bounded on the south by a line drawn northwestward of the flats which extend northwestward from the islands off the northern side of Lolland, by Vejro, Femø, and the north coast of Falster to Orehoved, and by the flats between these islands.

THE NORTH COAST OF LOLLAND BETWEEN ONSEVIG AND URNE FISHING HARBOR, about 6 miles eastward, is low and flat. The land within the (continued next page).

coast is crossed by numerous hedges, and a short distance inland are several woods. Vindeby Church, Uterslev Church, and Horslunde Church, all of which are white, are located about $2\frac{3}{4}$ miles southeastward, 3 miles east-southeastward, and 4 miles southeastward, respectively, of Klinteodde (sec. 2C-8).

The shorebank extending from this stretch of coast to the 3-fathom curve varies in width from about $\frac{1}{2}$ mile to $3\frac{1}{2}$ miles. Outside the eastern part of this shorebank are very irregular depths of $2\frac{3}{4}$ to $7\frac{1}{2}$ fathoms as far northward as the deep channel in the southeastern approach to Omø Sund.

Vejrø lies with its southwestern extremity about 5 miles north-northeastward of Urne Fishing Harbor. It is a low island and is considerably built over. A shorebank of varying width surrounds Vejrø within the 3-fathom curve. **Vejrø Vestre Flak**, the western part of this shorebank, extends up to $1\frac{3}{4}$ miles from the northwestern side of the island and has several 3- to 7-foot rocky patches on it. The northwestern extremity of Vejrø Vestre Flak is marked by a conical buoy moored in a depth of 4 fathoms about $2\frac{1}{4}$ miles west-northwestward of the northeastern extremity of the island, and the southwestern side of the flat is marked by a spar buoy moored about 1 mile westward of the southwestern extremity of the island. The shorebank extends about $\frac{2}{3}$ mile from the northeastern end of Vejrø.

The southern and southeastern portions of the shorebank around Vejrø are described in section 7A-21.

Between Vejrø Vestre Flak and the 6-fathom curve, which lies from $2\frac{1}{2}$ to 3 miles off the northwestern side of Vejrø, are several patches with depths of 3 fathoms or less. The 6-fathom curve off this side of the island is on the eastern side of a channel which has depths of $6\frac{1}{4}$ to 11 fathoms and which connects the western part of the main fairway with Staaldyb (sec. 7A-25) and the channel from Store Bælt passing south-

ward of Omø Staalgrunde (sec. 2C-7). The 6-fathom curve northward of Vejrø lies 2 to 3 miles from the northeastward extremity of the island. A $4\frac{3}{4}$ -fathom patch lies about $1\frac{2}{3}$ miles northward of Vejrø, and some patches with depths of $3\frac{3}{4}$ to $5\frac{1}{2}$ fathoms lie up to $1\frac{1}{4}$ miles northeastward and east-northeastward of the island. A wreck with a depth of $7\frac{1}{2}$ fathoms lies about $1\frac{3}{4}$ miles north-northeastward of Vejrø.

Vejrø Light ($55^{\circ}02' N.$, $11^{\circ}22' E.$) is shown on the northeastern end of Vejrø.

Vejrø Lighted Whistle Buoy is moored about $3\frac{3}{4}$ miles northwestward of Vejrø Light. It is replaced by a spar buoy when ice forms.

Femø, situated about $5\frac{1}{4}$ miles southeastward of Vejrø, is hilly in contrast with the other islands in these waters. Issemissehøj (Issemose Bjerg), the highest hill, rises on the southeastern part of the island to a height of 72 feet; it is surmounted by a triangulation station. Femø Church, which has a pointed tower, stands on the western side of the island.

About midway between Vejrø and Femø a bight of the 6-fathom curve extends southward into the entrance of Femø Sund (sec. 7A-23). Westward of this bight and from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles east-southeastward of the northeastern end of Vejrø is a flat with a least depth of $1\frac{3}{4}$ fathoms; eastward of the bight is a flat having a least depth of $2\frac{1}{2}$ fathoms in a position nearly $1\frac{1}{2}$ miles west-northwestward of Vindnæs Horn, the northern extremity of Femø. The 6-fathom curve passes northward of Femø from a position about $2\frac{1}{2}$ miles northwestward of Vindnæs Horn, its closest approach being about $\frac{3}{4}$ mile offshore. **Stenøre Nakke**, a projection of the shorebank consisting of sand and rocks, extends about $\frac{3}{4}$ mile northward from the northern side of the island; it has depths of 1 foot to 2 fathoms, and its extremity, which is fairly steep-to, is marked by a spar buoy moored in a depth of $3\frac{1}{4}$ fathoms. Femø Havn and the dangers adjacent to the western and

eastern sides and the southern extremity of Femo are described in sections 7A-23 and 7A-24.

A conical fairway buoy is moored about 2 1/2 miles northeastward of Andemose Nakke, the eastern extremity of Femo. This buoy marks the northern approach to Guldborg Sund.

7A-12 NORTHWESTERN SIDE OF FALSTER.—The northwestern extremity of Falster is a low, partly wooded peninsula lying with its southwestern point about 5 1/4 miles east-southeastward of Andemose Nakke. The principal woods on the peninsula are Resleskov, on the southwestern part, and Vaalse Vesterskov, on the northern part. Between the northern extremity of this peninsula and Orehoved, a wooded point lying about 2 1/2 miles eastward, is the entrance of Vaalse Vig, a shallow, rock-encumbered bay. Dyrefod, a wooded islet, lies close northward of Orehoved.

Vaalse Church, which is red and has a pointed tower, and Kippinge Church, which is also red and has a slender spire, are located respectively about 3 miles southwestward and 4 miles south-southwestward of the extremity of Orehoved. At Orenaesgaard, a farm situated about 1/2 mile southeastward of the extremity of Orehoved, there is a large red building which is a prominent landmark.

The shorebank extending from the northwestern part of Falster to the 3-fathom curve is very irregular both in contour and in depth. Vesterskov Flak and Dyrefod Flak are parts of this shorebank lying on the southern side of the main fairway. Kogrund and Sudero Flak, which are also portions of the shorebank on the northwestern side of Falster, are adjacent to the northern approach to Guldborg Sund and are described in section 7B-6.

VESTERSKOV FLAK extends about 2 1/2 miles northwestward from the northern part of the peninsula on which is Vaalse Vesterskov; there are many rocks on the inner part of this

flat. A spar buoy is moored on the flat in a position about 1 1/2 miles northwestward of the peninsula. Vesterskov Flak is prolonged northwestward by a projection of the shorebank, the northern extremity of which lies about 3 1/2 miles northwestward of Vaalse Vesterskov.

DYREFOD FLAK extends about 3 1/4 miles northwestward from Orehoved. Several detached shoals with depths of 3 fathoms or less lie off Dyrefod Flak and Vesterskov Flak. The northern side of one of these shoals, which has a least depth of 2 fathoms and extends nearly 1 mile northwestward from a position about 1 1/2 miles northward of Orehoved, is marked by a conical buoy.

OFF-LYING DANGERS AND CHANNELS BETWEEN VEJRO AND THE EASTERN END OF THE MAIN FAIRWAY

7A-13 Outside the flats and shoals previously described the depths decrease gradually from about 10 fathoms 2 miles northward of Vejro to about 7 fathoms 4 1/2 miles northward of Femo. A 4 1/4-fathom patch lies about midway between Vejro and Knudshoved, and from this patch the central part of the main fairway for a distance of nearly 7 miles east-southeastward is encumbered by shoals with depths of 3 to 6 fathoms. There are depths of 6 1/4 to 8 3/4 fathoms in some parts of this area. The southern side of a channel northward of the central shoal area is marked by two buoys moored about 1 1/2 miles southwestward and 3 3/4 miles southeastward of the extremity of Knudshoved; these buoys are equipped with reflectors. Between Knudskov Rev and the flats extending from Falster are irregular depths of 3 to 6 1/2 fathoms.

BREDEGRUND, about 3 miles north-northwestward of Orehoved, has a least depth of 2 fathoms. It is separated from Dyrefod Flak by a channel with very irregular depths of 2 1/2 to 5 3/4 fathoms. Between Bredegrund and the

shorebank extending from Sjælland is a narrow channel with depths of over 7 fathoms. A succession of patches with depths of $2\frac{3}{4}$ to $3\frac{1}{4}$ fathoms extends southeastward from the eastern extremity of Bredegrund to a position about $1\frac{2}{3}$ miles north-northeastward of Orehoved.

The southern side of Bredegrund is marked by a can **buoy** moored in a depth of 4 fathoms. The southern side of the channel northward of Bredegrund is marked by two conical **buoys**, the western of which is equipped with a reflector, and the northern side is marked by a can **buoy**.

Wrecks.—Two wrecks, each of which has a depth of $5\frac{1}{2}$ fathoms, lie close together about $1\frac{1}{3}$ miles north-northwestward of the northern extremity of Femø. Two wrecks, each with a depth of $4\frac{1}{4}$ fathoms, lie respectively about $2\frac{2}{3}$ miles south-southwestward and $3\frac{3}{4}$ miles south-southeastward of the extremity of Knudshoved. A wreck with a depth of 4 fathoms lies nearly $1\frac{1}{2}$ miles northward of Orehoved.

DIRECTIONS FOR THE MAIN FAIRWAY

7A-14 Having entered the western part of Smaalands Farvandet through one of the channels from Store Bælt, a vessel eastbound through the main fairway should pass between Kirkegrund and the flats extending from Vejrø, and thence southward of Venegrunde. The southern slope of Blaabjerg bearing 093° leads southward of Venegrunde in a least depth of 4 fathoms.

A vessel can pass between Kirkegrund and Venegrunde in a least depth of $4\frac{3}{4}$ fathoms by keeping Boeslunde Church and Magleby Church in range 338° , or in a least depth of 4 fathoms by keeping the southwestern spire of Holsteinborg Castle in range about 007° with the eastern extremity of Ormø.

After passing southward of Venegrunde a vessel bound for the eastern part of Smaalands

Farvandet should proceed along the southern side of Knudshoved, taking care to avoid the off-lying patches southward of the outer part of that peninsula and Knudsskov Rev, and should pass through the deep channel between Bredegrund and the Sjælland shorebank. From this channel the vessel can either continue in an east-southeasterly direction to Masned-sund or steer south-southeastward into Storstrøm. The depths along this route through the main fairway are sufficient for a vessel capable of entering Masned-sund, which has a least depth of 23 feet in its western approach and entrance; the other harbors and the channels in the eastern part of Smaalands Farvandet have lesser depths.

Vessels of suitable draft can pass southward of Bredegrund by bringing the summit of the highest hill of Kulsbjerge in range 088° with Vordingborg Church, which range leads northward of Vesterskov Flak and Dyrefod Flak in a least depth of 15 feet. This range leads southward of the buoy marking the southern side of Bredegrund and northward of the buoy marking the northern side of the detached shoal which lies about $1\frac{1}{2}$ miles northward of Orehoved. After passing the latter buoy, a vessel can proceed into Masned-sund or Storstrøm.

Vessels bound for Guldborg Sund from the western entrances of Smaalands Farvandet, having passed between Kirkegrund and the shorebank extending from Vejrø, should steer an east-southeasterly course for the fairway buoy moored about $2\frac{1}{2}$ miles northeastward of Andemose Nakke. Directions for the northern approach to Guldborg Sund are given in section 7B-7.

At night the lights on Omø and Vejrø are good guides in the western and central parts of the main fairway. The white sector of Ore Light (sec. 7C-1) leads between Bredegrund and Dyrefod Flak, and the white sector of Orehoved Light (sec. 7C-14) leads into Stor-

strøm. The channel northward of Bredegrund is unlighted.

KARREBÆKSMINDE BUGT

7A-15 Karrebæksminde Bugt is the water area lying northward of Venegrunde and Knudshoved Rev. It has fairly regular depths up to 7 fathoms and is clear of dangers between the shoals on its southern side and the shorebank extending from the Sjælland coast. The bottom is ooze and mud in the middle of the bay and sand toward the sides. The currents are irregular and are mainly dependent on the wind.

The northern side of the bay is formed by the south coast of Sjælland between Bisserup (sec. 7A-9) and Karrebæksminde, about $5\frac{1}{2}$ miles east-southeastward. The land along the coast has a height of about 100 feet in places. Klinteby Klint, which rises steeply from the shore about 2 miles east-southeastward of Bisserup, is 95 feet high. Karrebækstorp Skov is located about 1 mile west-northwestward of Karrebæksminde. Karrebæk Church, which is white and has a tower, stands on a hill nearly 1 mile north-northeastward of Karrebæksminde and is a prominent landmark.

The shorebank within the 3-fathom curve is fairly wide along the greater part of this stretch of coast. **Bisserup Hage**, a projection of the shorebank with rocks on its inner part, extends nearly $1\frac{1}{2}$ miles southward from the eastern entrance point of Holsteinborg Nor (sec. 7A-9). **Bisserup Red** comprises two anchorages, one on either side of Bisserup Hage. Small vessels can anchor in Bisserup Vestre Red, the west-end anchorage, in 4.0 m (2.1 fm), good holding ground, about $\frac{1}{2}$ mile south-southwestward of Bisserup Pier. A rock with a depth of 5 feet lies on the shorebank on the western side of the entrance. Winds between south and west raise a considerable sea in Bisserup Vestre Red. Bisserup Østre Red, on the eastern side of Bisserup Hage, has depths of over $3\frac{1}{4}$ fathoms from its entrance to a position nearly $\frac{1}{2}$ mile southeast-

ward of the eastern entrance point of Holsteinborg Nor. The shorebank forming the north-eastern side of this anchorage is a gradually sloping sand flat.

Karrebæksminde Red, an indentation of the shorebank, fronts the coast in the vicinity of Karrebæksminde. It affords anchorage in depths of over 4 fathoms within about $\frac{1}{3}$ mile westward and west-southwestward of the harbor entrance at Karrebæksminde; the holding ground is good. Onshore winds raise some sea at this anchorage.

The ports of Karrebæksminde and Næstved are described in section 7A-16.

From Karrebæksminde to the inner end of Knudshoved the coast trends in a southeasterly direction for about $10\frac{1}{4}$ miles. For nearly 4 miles southeastward of Karrebæksminde the outer coast consists of Enø and Dybsø. Within these islands are Karrebæk Fjord and Dybsø Fjord, both of which are shallow. A narrow passage at the northwestern end of Enø forms the inner part of the harbor of Karrebæksminde and through it passes the dredged channel leading to Næstved. Dybsø Fjord is accessible only for small craft. Svinø Land, on the southern side of Dybsø Fjord, is a peninsula projecting westward and northward and rising to an elevation of 62 feet in its western part.

Firing range.—A firing range, marked by buoys painted black and yellow, lies in Dybsø Fjord. During firing exercises, a signal of one or two balls is displayed at two signal masts ashore.

Avnø Fjord, a mainly shallow inlet, extends east-southeastward from the southeastern part of Karrebæksminde Bugt and separates Svinø Land from Knudshoved. It is encumbered with many rocks and shoals, and is navigable only by small vessels with local knowledge. An unmarked channel leads to the inner part of Avnø Fjord, passing close southward of Avnø Røn, an islet in the middle of the fjord.

KARREBAEKSMINDE AND NÆSTVED

Position: 55° 11' N., 11° 39' E.
 Depths: Approach, 6.1 m (20.0 ft.).
 Channel to Naestved, 6.0 m (19.6 ft.).
 Karrebaeksminde, 3.0 to 4.9 m (9.8 to 16.0 ft.).
 Naestved, 2.0 to 6.0 m (6.5 to 19.6 ft.).
 Tidal range: About 1 foot.

7A-16 The port of Karrebaeksminde is located in the northeastern part of Karrebaeksminde Bugt and is about 18 miles eastward of the western entrance of Omo Sund. The harbor is protected by breakwaters, and its inner part is a cut which separates Eno from the main part of Sjaelland and affords access to Karrebaek Fjord. A dredged channel connects the entrance at Karrebaeksminde with the port of Naestved, which is situated on Susaa and about 4 1/2 miles northeastward of Karrebaeksminde. The channel leads through Karrebaek Fjord and thence through a canal to the harbor at Naestved. This harbor consists of a dredged portion of Susaa adjacent to the town and comprises four basins.

TIDES AND TIDAL CURRENTS.—The mean range of tide at both Karrebaeksminde and Naestved is about 1 foot. The tidal currents through the harbor at Karrebaeksminde change direction regularly about every 6 hours, but they are considerably affected by the wind. With the incoming current the water rises the first 5 hours and falls during the last hour; with the outgoing current it falls the first 5 hours and rises during the last hour. The tidal currents setting through the harbor may attain a velocity of as much as 6 knots.

WATER LEVEL.—Northerly winds may raise the water level about 4 feet at Karrebaeksminde, and northwesterly winds may raise it the same amount at Naestved. Southerly and easterly winds may lower the water level about 2 1/2 feet at the former port, and southeasterly winds may lower it about 1 1/2 feet at the latter.

ICE.—See table 5 in chapter 1 for ice information.

HARBORS AND CHANNEL.—The outer harbor of Karrebaeksminde is formed by two breakwaters extending from the shore on either side of the entrance of the cut leading into Karrebaek Fjord; this cut is the inner harbor of the port. The entrance between the breakwater heads faces southwestward and is about 230 feet wide. A short mole extends west-southwestward from the northern side of the entrance of the cut. A single-leaf bascule road bridge crosses the cut about 1/3 mile east-northeastward of the harbor entrance. This bridge has a horizontal clearance of 76 feet and, when closed, a vertical clearance of 8 feet.

Two lights are shown on the head of the northern breakwater, and a light is shown on the head of the southern breakwater. Lights mark both sides of the bridge opening.

The dredged channel from the harbor entrance at Karrebaeksminde to Naestved has a depth of 6.0 m (19.6 ft.). For about 200 yards inside the entrance the width of the channel is about 230 feet. For the remainder of the distance to the harbor at Naestved the bottom width of the channel varies from 52 to 65 feet in the straight reaches and is somewhat wider at the bends. The canal through which the northeastern part of the channel passes is about 1 mile long between its entrance from Karrebaek Fjord and its junction with Susaa close west-southwestward of the harbor at Naestved.

From the entrance at Karrebaeksminde to the canal the channel is marked by buoys in accordance with the Danish uniform system. Some of the buoys are equipped with reflectors. Two beacons, one of which is surmounted by a diamond-shaped topmark and the other by a triangle, point up, are located close northwestward of the channel in the northern part of Karrebaek Fjord. A beacon with a triangular topmark, point down, stands close northward of the fjord. The two beacons surmounted by triangles form a range leading northeastward through the dredged channel to

a position nearly 1 mile west-southwestward of the canal entrance. A mill standing close northward of Karrebæk Church and the beacon having the diamond-shaped topmark form a range for the remainder of the channel in the fjord and for the canal.

Several **submarine cables** cross the channel in the vicinity of the bridge at Karrebæksminde, and a high tension cable crosses about 250 yards east-northeastward of the bridge. Other submarine cables are laid across the channel about midway through the canal and in two places between the canal and Næstved. The location of each of these cables is indicated by notice boards.

A **pipeline**, marked by notice boards, is laid across the channel a short distance east-northeastward of the bridge.

An **overhead power cable**, with a vertical clearance of 108 feet, spans the channel close southwestward of Næstved.

Outside the dredged channel in the harbor at Karrebæksminde the depths range from 3 to 16 feet. Except in the channel, Karrebæk Fjord is navigable only by small craft.

The harbor at Næstved comprises Søndre Havnebassin; Svajebassin, Vestre Havnebassin, and Gammel Havn. Søndre Havnebassin, nearly $\frac{1}{2}$ mile northeastward of the junction of Susaa and the canal, is a 1,250-foot section of the river. The 19 $\frac{1}{2}$ -foot dredged channel from Karrebæksminde continues through this basin and into Svajebassin, where it becomes wider. Vessels with lengths up to 410 feet can turn round in Svajebassin. Vestre Havnebassin, the northernmost basin, is entered from the northwestern part of Svajebassin and has a depth of 19 $\frac{1}{2}$ feet. Gammel Havn, a small basin with a depth of 6 $\frac{1}{2}$ feet, is entered from the northeastern part of Gammel Havn. Above the harbor the Susaa is diverted across the western side of Næstved through a tunnel that empties into the head of Gammel Havn.

Regulations and signals.—Vessels passing through the dredged channel between the harbors of Karrebæksminde and Næstved are subject to the regulations for the navigation of nar-

row channels in Danish waters (sec. 1-39), except that a vessel proceeding against the tidal current is required to give way to a vessel proceeding with it.

Vessels bound to or from Næstved can pass through the bridge at Karrebæksminde without charge at any time between $\frac{1}{2}$ hour before sunrise and $\frac{1}{2}$ hour after sunset, but not earlier than 0500 nor later than 2100. Under exceptional circumstances the bridge may be opened at night if arrangements are made with the bridgmaster during normal service hours and a fee is paid.

To request that the bridge be opened, a vessel intending to pass through should make the following signals:

By day.—The International Code flag "N" or, if this is not available, the national ensign, either being hoisted at half-mast on the foremast; also one long blast and one short blast of the whistle or foghorn.

At night.—A white light at the bow and a sound signal the same as the one made by day.

These signals should be made by inbound vessels when within the entrance to the harbor at Karrebæksminde and by vessels from Næstved when they are at least $\frac{1}{2}$ mile from the bridge; the latter vessels must also notify the harbor office of the exact time of departure from the harbor at Næstved. A vessel at anchor or alongside at Karrebæksminde must also make the signals described above, but she should not get underway until the signal permitting passage is given from the bridge.

The signals requesting that the bridge be opened are answered from the southern end of the bascule span as follows, the signals being the same both by day and at night:

- (a) One red light, indicating that passage is prohibited and that the vessel must anchor.
- (b) Two red lights, indicating that west-bound vessels can pass through.
- (c) Three red lights, indicating that east-bound vessels can pass through.

(d) A violet light shown with signals (b) or (c), indicating that vessels must warp through the bridge.

If a signal permitting passage is shown, but unforeseen circumstances prevent the opening of the bridge, a long blast is sounded from a siren on the bridge.

Until the signal permitting passage is received a vessel must keep at least 765 yards from the bridge. Only one vessel at a time may pass through the bridge, and vessels under sail take precedence over steam and motor vessels. While a vessel is approaching and passing through the bridge, she shall have an anchor ready for letting go. Booms, boats, davits, and other movable objects projecting beyond the sides of a vessel must be rigged inboard. Mooring to the bridge and climbing on to it from a vessel are prohibited.

Within a distance of 110 yards of the bridge, vessels must proceed at the lowest speed necessary for maneuvering. Anchoring within 275 yards of the bridge is prohibited except in an emergency, such as danger of collision with the bridge. If it is necessary to anchor, care must be taken to avoid the submarine cables and the pipeline that cross the channel.

When vessels bound through the bridge are within 275 yards of it, the instructions of the bridgmaster must be strictly obeyed.

Pilots for Karrebæksminde and Næstved are available in Karrebæksminde. Pilotage is compulsory for vessels over 150 GRT when navigating in Karrebæksminde and Næstved and in the channel between the two harbors. See also section 7-6.

Directions.—Karrebæk Church in range with the eastern side of the first cliff westward of Karrebæksminde leads into Karrebæksminde Red (sec. 7A-15). The harbor of Karrebæksminde is entered from the northeastern part of the roadstead. To avoid the shorebank which extends from the western side of Enø, Karrebæk Church should not be seen eastward of the head of the northern breakwater.

At night, a white sector of one of the lights on the head of the northern breakwater leads between Kirkegrund and Venegrunde and thence to the harbor entrance in a least charted depth of 4.3 m (2.4 fm). A second white sector of the same light leads westward of the buoy marking the western extremity of Knudshoved Rev and thence toward the harbor in a least depth of 4 1/4 fathoms, but within a distance of about 1/4 mile from the harbor entrance the depth in the eastern part of this sector is only about 5.7 m (18.7 ft.), whereas the depth in the western part is not less than about 20 feet.

7A-17 KARREBÆKSMINDE, which was the port for Næstved before the harbor at the latter place was developed and the approach channel was dredged, is now of little commercial importance. The village of Karrebæksminde is situated on the northern side of the passage that gives access to Karrebæk Fjord. The harbor office stands near the northern end of the bridge across the channel and the custom house is a short distance westward of the bridge. There is about 900 feet of quayage with depths of 3.0 to 4.9 m (9.8 to 16.0 ft.) alongside on the northern side of the harbor and westward of the bridge. A quay on the southern side of the inner harbor has a length of 260 feet and a depth alongside of 3.5 m (11.4 ft.). Provisions and water can be obtained.

NAESTVED, an industrial town and a railroad junction, has a population of about 22,113 (1965). The port area extends into the southwestern part of the town. The cargoes discharged from vessels in the port consist mainly of bulk commodities—timber, wood pulp, coal, petroleum products, grain, oilcake, fertilizers, and kaolin. Outward cargo includes paper, dairy products, cattle, and grain. Næstved is a first port of entry. The customhouse and the harbor office are located at the head of Vestre Havnebassin.

A quay with a depth of 19 1/2 feet alongside extends along the western side of Søndre Havnebassin for a distance of about 1,200 feet. On the western side of Svajebassin is a tanker berth consisting of a T-head pier and two dolphins, one of which stands off each end of the pierhead and in line with its face; the distance between the dolphins is 150 feet and the depth alongside is 5.2 m (17.0 ft.). A quay on the eastern side of Svajebassin has a length of 250 feet and a depth of 17 feet alongside. The western side of Vestre Havnebassin has about 900 feet of usable berthing space with a depth of 19 1/2 feet alongside. On the eastern side of the inner part of Vestre Havnebassin is an offshore berth consisting of a T-head pier with two dolphins off each end of the pierhead; the distance between the northern-

most and southernmost dolphins is 265 feet and the depth alongside is 19 1/2 feet. Gammel Havn, which has a depth of 6 1/2 feet, affords berthing for small craft.

The quays on the western sides of Søndre Havnebassin and Vestre Havnebassin are served by rail. A tug, which is also used as an icebreaker, is based at Næstved. Ten cranes with lifting capacities up to 3 3/4 tons are on the quays; they are used mainly for handling bulk cargoes.

Provisions can be obtained. Water is piped to hydrants on the principal quays. Coal and petroleum products are available. Only minor repairs can be made; there are machine shops in the town. Railroad communication is maintained with all parts of Denmark and with other countries of Europe.

NORTHERN SIDE OF LOLLAND BETWEEN URNE FISHING HARBOR AND VIGSNÆS

7A-18 The Lolland coast between Urne Fishing Harbor and Vigsnæs, about 12 1/2 miles east-southeastward, is mostly low except for a short hilly stretch about 1 mile southward of Kragenæs Havn, a small port lying about 3 1/4 miles southeastward of Urne Fishing Harbor. Along this coast are numerous wooded areas, some of which extend to the edge of the water.

There are few prominent landmarks on the northern side of Lolland. Vindeby Church, Utterslev Church, and Horslunde Church are described in section 7A-11. Bandholm Church, a red structure surmounted by a tall, slender spire, stands about 6 miles southeastward of Kragenæs Havn and is visible from nearly all directions. Orebygaard, a red building with two spires, of which the northern is the higher, is located on the northeastern side of Sakskøbing Fjord and nearly 4 1/2 miles eastward of Bandholm Church. Taars Church, which is white, and Sakskøbing Church, which has a spire, are located respectively about 1 1/2 miles eastward and 2 1/4 miles southeastward of Orebygaard. Vigsnæs Church, which has a pointed tower, stands about 1 mile southeastward of the northern extremity of Vigsnæs.

Extensive flats, on which are several islands, front the north coast of Lolland and occupy much of the southern half of the western part of Smaalands Farvandet. The descriptions of

these flats and islands, with the exception of those described with related features of the Lolland coast, are given in sections 7A-21 to 7A-24. The only deep channel in this area is that comprising Staaldyb (sec. 7A-25) and its continuation, Lindholm Dyb.

Pilots for the ports on the north coast of Lolland and for the harbors and channels among the islands lying off this coast are stationed at Bandholm and Oreby. A pilot lookout station is maintained and a pilot vessel is stationed at Kragenæs Havn. Bandholm and Oreby pilots will, in addition to local piloting, take vessels to other parts of Smaalands Farvandet and to ports in Store Bælt. Pilots must be ordered in advance and will meet vessels outside Staaldyb or off Raago.

Urne Fishing Harbor (54°57'N., 11°17'E.) is a small offshore basin which is connected with the shore by a causeway about 1,250 feet long. In 1966, depths in the entrance channel were 1.0 m (3.2 ft.) and in the harbor, 1.5 m (4.9 ft.). In 1966, depths in the entrance channel were 1.0 m (3.2 ft.) and harbor, 1.5 m (4.9 ft.). Northerly winds raise the water level and southwesterly winds lower it.

Raago, about 1 mile northeastward of Urne Fishing Harbor, and **Raago Kalv**, close westward of the northern part of Raago, lie on the shorebank extending from the Lolland coast to Staaldyb. These islands are small, low, and flat, and are joined to each other by a ridge of rocks with depths of less than 6 feet over them. Raago, which is inhabited is covered with hedges and brush; a conspicuous pilot lookout tower stands on the eastern side of the island. **Raago Flak**, with depths of less than 3 fathoms, surrounds Raago and Raago Kalv and extends about 2 3/4 miles northwestward from the latter. The inner part of this flat is foul. The northeastern side of Raago Flak forms a part of the southwestern side of Staaldyb and is steep-to. This side of the flat is marked by a conical **buoy** moored about 1 1/2 miles northward of Raago Kalv and a spar **buoy** moored about 1/2 mile northward of Raago.

Raago Sund, the passage between Raago and Lolland, is used by small vessels with local knowledge. In the northwestern part of the

sound there are depths of as much as $3\frac{1}{4}$ fathoms, but southward of Raagø a depth of not more than 8 feet can be relied on. Two spar buoys are moored on the northeastern side of the channel, and one spar buoy is moored on the southwestern side. A submarine cable is laid from Raagø to a position on the Lolland coast about $\frac{2}{3}$ mile southeastward of Urne Fishing Harbor. The direction of this cable is indicated by two range beacons on Raagø.

Kragenæs, a broad, rounded projection on the Lolland coast, lies from 2 to $4\frac{1}{4}$ miles southeastward of Urne Fishing Harbor. **Kragenæs Øre**, the shorebank extending nearly $\frac{2}{3}$ mile from Kragenæs, is marked on its outer edge by a spar buoy. Immediately outside this buoy the depths increase abruptly from about 3 fathoms to 4 and 5 fathoms.

Kragenæs Havn is located about midway on the coast of Kragenæs. It is a small basin between two moles which extend eastward from the shore. The entrance, about 50 feet wide, is between the outer end of the northern mole and the head of a breakwater extending north-northeastward from the southern mole. The harbor has depths of 0.5 to 3.3 m (1.6 to 10.8 ft.) in the outer part and 0.4 to 2.5 m (1.3 to 8.2 ft.) in the inner part. An approach channel, which is buoyed in accordance with the Danish uniform system, is dredged to a depth of 3.4 m (11.1 ft.). The depth in the channel may be reduced by weed that accumulates during northerly gales. A ferry berth is located on the northern side of the harbor entrance. Pilots are available from Bandholm and Oreby.

A light is shown from the northern side of the entrance to the harbor. Two beacons with triangular topmarks stand close westward of the harbor and in range about 260° lead through the approach channel.

Small amounts of provisions and water are available. The harbor is connected with the Lolland railroad system. There is ferry service to Fejø.

Submarine cables are laid from Kragenæs to the southwestern side of Fejø. Their direction is indicated by range beacons on Fejø.

7A-19 Between Kragenæs Havn and Blans (Blands) Hoved, about $3\frac{3}{4}$ miles southeastward, the shorebank extends up to $1\frac{1}{2}$ miles from the Lolland coast to Staalby and Lindholm Dyb. **Lindholm**, a partially wooded islet, lies on the outer part of the shorebank and about 1 mile northeastward of Blans Hoved. A flat with depths of 3 feet and less lies between Lindholm and the coast in the vicinity of Blans Hoved. **Stenhjelm**, a rocky patch with a depth of 4 feet, is located on the extremity of a spit which extends about 1 mile west-northwestward from Lindholm. A spar buoy is moored in a depth of 3 fathoms nearly $\frac{2}{3}$ mile northward of Stenhjelm and about $1\frac{1}{2}$ miles northwestward of Lindholm. **Lindholm Rev**, composed of sand, gravel, and rocks, extends about $\frac{1}{4}$ mile north-northeastward from the northeastern end of Lindholm to Lindholm Dyb; its extremity, which has a depth of 2 feet and is steep-to, is marked by a spar buoy with a reflector.

Two range lights for the outer reach of Bandholm Rende are shown on Lindholm from 1 August to 5 May. These lights in range bear 313° .

A submarine cable is laid from a position on the Lolland coast about $1\frac{1}{2}$ miles northward of Bandholm church to the southwestern extremity of Askø. It is marked at each end by a pair of range beacons.

Bandholm, about $2\frac{3}{4}$ miles southeastward of **Blans Hoved**, is the port for the inland town of **Maribo**, which is situated about $3\frac{3}{4}$ miles southward of Bandholm and is connected with it by railroad. The harbor is formed by two moles extending in a general northeasterly direction from the shore. The entrance, which faces eastward, is about 180 feet wide. A wide mole extending from the northwestern mole divides the harbor into two basins. A dredged area with a depth of 19 feet extends from the entrance along the southeastern mole and widens in the inner basin to enable vessels to turn. Elsewhere in the harbor there are depths of 2.5 to 4.4 m (8.2 to 14.4 ft.). Gales between northwest and northeast may raise the water level 3 feet, and gales between southeast and southwest may lower it 2 feet.

Bandholm Rende, the approach channel to the harbor, is entered from **Lindholm Dyb** about $\frac{3}{4}$ mile southeastward of Lindholm and is dredged to a depth of 19 feet. It is marked by **buoys** in accordance with the Danish uniform system; some of the buoys are equipped with reflectors. The outer reach of this channel leads southeastward for a distance of about $1\frac{3}{4}$ miles from its entrance. About 1 mile north-northeastward of the harbor entrance the channel turns sharply south-southwestward and continues in that direction to a position close southeastward of **Havneø**, a small islet lying a short distance northeastward of the harbor. At this position the channel turns southwestward toward the harbor entrance. A boat channel westward of the dredged channel and about $\frac{3}{4}$ mile northward of the harbor is marked by spar **buoys**.

The range lights on Lindholm lead through the outer reach of Bandholm Rende. Two **lights** are shown on the coast southward of the harbor. These lights in range 201° lead from the outer reach to the bend southeastward of **Havneø**; a white **beacon** with a triangular topmark, point down, stands close south-south-

westward of the front light and in the alignment of this range. Two **lights** shown within the harbor lead through the entrance from the bend of the channel southeastward of **Havneø** when they are in range 238° . A **light** is shown on each side of the harbor entrance. All lighted navigational aids at Bandholm are shown from 1 August to 5 May.

Vessels in the harbor and proceeding through the dredged approach channel are subject to the regulations for the navigation of narrow channels in Danish waters (sec. 1-39), except that an outgoing vessel must wait for an inbound vessel.

The main quay is on the southeastern side of the harbor; it has about 750 feet of berthing space with a depth of 19 feet alongside. There are several other quays with lesser depths alongside. The quays are connected by rail with the line to Maribo. A 2-ton coal crane and a grain elevator are available. Provisions, water, and coal can be obtained. A marine railway with a lifting power of 100 tons is located in a small shipyard on the mole between the outer and inner parts of the harbor. The customhouse for the port stands at the head of the harbor.

Pilots are available in Bandholm and Oreby. Inbound vessels obtain pilots from Kragenaes.

7A-20 Sakskøbing Fjord.—The outer part of Sakskøbing Fjord is the water area between Bandholm and **Stensore**, a partially wooded peninsula projecting northwestward and terminating in two points lying about $2\frac{2}{3}$ and $3\frac{1}{3}$ miles east-northeastward of the harbor at Bandholm. The inner part of the fjord is a narrow inlet extending nearly $2\frac{1}{4}$ miles southeastward from Oreby, which is situated on the northeastern shore and about $1\frac{3}{4}$ miles southeastward of the northwestern extremity of Stensore, to the small port of Sakskøbing.

Oreby Rende, the dredged approach channel to Sakskøbing, branches from Bandholm Rende near the outer end of the latter channel. The depth in Oreby Rende is 15 feet as

far as Oreby, and $14\frac{1}{2}$ feet from Oreby to Sakskøbing. The channel is **buoyed** in accordance with the Danish uniform system. A square white **beacon** with a vertical black stripe is located nearly 1 mile south-southeastward of the northwestern extremity of Stensore. This beacon and the lower spire of Orebygaard (sec. 7A-18) in range 121° lead from Bandholm Rende to a position about $\frac{2}{3}$ mile westward of the western extremity of Stensore. From this position two pairs of **range beacons** located on the southern side of the fjord opposite Oreby and at Oreby, respectively, lead to the narrow inner part of the fjord; the western range bears $132\frac{1}{2}^\circ$, and the eastern range bears $109\frac{1}{2}^\circ$. The front beacons of these two pairs have diamond-shaped topmarks, and the rear beacons are surmounted by triangles, points down.

A **wreck** with a depth of $1\frac{1}{2}$ fathoms lies on the northern edge of Oreby Rende in a position nearly $1\frac{1}{2}$ miles north-northeastward of the harbor entrance at Bandholm.

A **spoil ground**, marked by four green poles, lies between the dredged channel and the southern side of Sakskøbing Fjord.

Oreby Pier projects from the shore on the northeastern side of the fjord and southwestward of Orebygaard. At its head is a berth about 100 feet in length with a depth of $6\frac{1}{2}$ feet alongside. Strong winds between northwest and northeast may raise the water level about 2 feet, and those from east through south to west may lower it about 3 feet. The currents in the vicinity of Oreby Pier are sometimes strong.

Sakskøbing ($54^\circ 48' N.$, $11^\circ 83' E.$), at the head of the fjord, has a harbor with a depth of $14\frac{1}{2}$ feet except in a few places. Northerly and northwesterly winds may raise the water level about 2 feet, and southerly and southeasterly winds may lower it the same amount. A small stream flowing into the head of the harbor sometimes causes an outgoing current. There

being no lighted aids for the navigation of Oreby Rende at night, vessels can enter and leave the harbor only by day. Vessels proceeding through the approach channel from Lindholm Dyb are subject to the regulations for the navigation of narrow channels in Danish waters (sec. 1-39), except that an outgoing vessel must wait for an incoming vessel. Between Oreby and the harbor of Sakskøbing, the speed of steam and motor vessels of 30 gross tons and over must not exceed 4 knots, and the speed of those of less than 30 tons must not exceed 6 knots.

The **town of Sakskøbing** had a population of about 2,600 in 1955. A customhouse is located near the head of the harbor. There is about 1,800 feet of quayage with depths of 8 to $14\frac{1}{2}$ feet in the port. A $2\frac{1}{2}$ -ton coal crane, a mobile crane, and a grain elevator are on the quays. The harbor berths are connected with the Lolland railroad system. A tug is available. Provisions, water, and coal can be obtained. Minor repairs can be made; there are two machine shops in the town.

Pilotage is compulsory for vessels of more than 100 net tons between Oreby and Sakskøbing. Pilots can be obtained from Oreby and Bandholm. See also section 7A-18.

Coast of Lolland from Sakskøbing Fjord to Guldborg Sund.—**Vignæs**, a low, partially wooded peninsula, lies with its northern extremity about $3\frac{1}{4}$ miles northeastward of the northern point of Stensore. It forms the southwestern side of the entrance of Guldborg Sund, which is described in section 7B-6. **Taars Vig**, the bay separating Vignæs from Stensore, is mainly shallow. A **firing practice area** in Taars Vig is marked by several black spar **buoys**, and warning signals are displayed from two signal masts. **Vigsø**, a small, narrow island, lies close off the northern extremity of Vignæs.

Vigsø Flak, the outer part of a flat extending about 2 miles north-northwestward from Vigsø,

has depths of less than 3 fathoms over a bottom of sand and stones. The inner part of this flat has depths of less than 1 fathom.

ISLANDS AND SHOALS BETWEEN VEJRO AND THE NORTHEASTERN PART OF LOL-LAND

7A-21 A large flat, the greater part of which has depths of less than 3 fathoms, extends from the Lolland coast between Sakskobing Fjord and Guldborg Sund to a position about 15 miles northwestward of Stensore. It is bordered on the north by the main fairway through the western part of Smaalands Farvandet, on the east by the northern approach to Guldborg Sund, and on the southwest by Staaldyb, Lindholm Dyb, and Oreby Rende. Vejro lies on the northwestern end of this flat, and between Vejro and Stensore are Skalo, Fejo, Lilleo, and Asko; Femo, about midway between Vejro and Vigsnaes, lies on a projecting part of the northeastern side of the flat. There are several channels among these islands, but, as they can be navigated only by small vessels with local knowledge, no detailed descriptions of them nor directions for their use are given.

Vejro, the shorebank extending from its northwestern and northeastern sides, and the flat lying east-southeastward of its northeastern extremity are described in section 7A-11. Femo and the dangers adjacent to its northern side are described in the same section.

VALLEGRUND, the inner part of the shorebank extending southward from Vejro, has depths of less than 1 fathom. Its southern extremity is marked by a spar buoy moored in a depth of 2 fathoms nearly 1/2 mile southward of the southwestern extremity of Vejro.

The southeastern part of the shorebank surrounding Vejro extends about 1 1/2 miles from the island. A spar buoy is moored in a depth of 2 fathoms on the northwestern side of a 1 1/2-fathom rocky patch lying on this part of the bank.

Two submarine cables are laid between the southern side of Vejro and Skalo and Fejo, respectively. Range beacons mark the landing places of the eastern cable.

SKALO lies about 3 1/3 miles southward of Vejro. There are some farm buildings on this island, and a small fishing harbor indents its southern side.

A ridge with depths of less than 3 fathoms extends about 4 1/2 miles northwestward from Skalo. This ridge is separated from the shorebank extending from the southwestern part of Vejro by a channel which has irregular depths up to 6 fathoms. Fejo Staalgrund, the central part of the ridge, has depths of less than 1 fathom and dries in places near its southern end. A spar buoy is moored in a depth of 2 fathoms about 1/2 mile northwestward of Fejo Staalgrund and nearly 1 1/2 miles west-southwestward of Vejro. A can buoy is moored in a depth of 5 1/2 fathoms about 1 1/3 miles northward of Raago; this buoy marks the northeastern side of Staaldyb abreast Fejo Staalgrund. Raago Naebbe Grund and Skalo Grund, which form the inner part of the ridge, have depths of less than 1 fathom; they extend respectively about 1 mile north-northwestward and 1 1/3 miles northward from Skalo, and their northern extremities are marked by spar buoys.

7A-22 FEJO, a rather flat island without woods, is situated with its northwestern extremity nearly 1/4 mile southward of Skalo and is connected with the latter island by a causeway. There are houses and other buildings on most parts of Fejo. Avernakke, the southern extremity of the island, is a low tongue of land terminating about 2 1/3 miles south-southeastward of the causeway to Skalo. Fejo Sletter, the southeastern extremity of Fejo, lies about 2 3/4 miles east-northeastward of Avernakke, and the coast between these points forms a bight in which is located Fejo Havn. Fejo Church, a white building with a red roof and a pointed tower, is situated on the coast about 3/4 mile north-northeastward of Avernakke.

A flat with depths of less than 3 fathoms extends about 3 1/4 miles in a general north-northwesterly direction from the northeastern extremity of Fejo. Skallebakken, on the outer part of the flat, has a least depth of only 1 foot, and Hjortemose Grund, the inner part of the flat, has depths of less than 1 fathom. Narrow channels with depths exceeding 3 fathoms separate the northwestern and northern parts of this flat from the shorebank extending southeastward from Vejro and from the flat (sec. 7A-11) lying east-southeastward of the northeastern end of the same island.

The greater part of the shorebank extending from the western sides of Skalo and Fejo to Staalby is narrow and steep-to. Avernakke Hage, with depths of less than 2 fathoms over a bottom of sand and rocks, extends about 3/4 mile south-southwestward from Avernakke. A spar buoy with a reflector is moored in a depth of 4 3/4 fathoms off the southern extremity of Avernakke Hage.

The portion of the large flat extending northwestward from Lolland that lies between Fejo and Lilleo, about 2 miles southeastward, has depths ranging from less than 1 fathom to about 3 1/4 fathoms. A channel with a least depth of 2 fathoms leads northeastward across the flat from the southeastern end of Staalby to a position about 2/3 mile southwestward of Fejo Sletter. Thence the channel, with its least depth reduced to 10 feet, continues in an east-northeasterly direction to a position about 3/4 mile eastward of Fejo Sletter. Several dangers adjacent to the channel are marked by buoys in accordance with the Danish uniform system. The direction of the channel for buoyage purposes is shown in figure 1. This channel is available for small vessels bound for Fejo Havn as well as those proceeding between Staalby and Femo Sund or the northern approach to Guldborg Sund. Vessels can anchor in most parts of the channel; the holding ground is good.

A submarine cable is laid from a position on the east coast of Fejo about 1/2 mile northward of Fejo Sletter to the west coast of Femo near Femo Havn. The direction of this cable is indicated by the range beacon on each coast.

VESTERBY HAVN, about midway along the west coast of Fejo, is a small and shallow artificial harbor. Depths in the approach channel are 3.1 m (10.1 ft.) and in the harbor, 0.3 to 3.4 m (0.9 to 11.1 ft.). The ferry from Kragenaes Havn (sec. 7A-18) berths in a slip within the harbor. Vessels approaching Vesterby Havn should take care to avoid two large rocks lying about 100 yards south-southeastward of the head of the mole.

FEJO HAVN (54° 57' N., 11° 26' E.), situated at the head of the bight between Avernakke and Fejo Sletter and nearly 1 1/4 miles westward of the latter point, is a small basin lying between two moles extending southward from the shore. The entrance is approached by a narrow dredged channel marked by buoys. There are depths of 5 to 10 feet in the harbor and 10 feet in the approach channel. North-easterly winds may raise the water level about 4 feet, and southwesterly winds may lower it about 3 feet. Two range lights are shown respectively on the head of the western mole and north-northwestward of the harbor; these lights in range 347° lead through the dredged channel. Provisions and water can be obtained.

Pilots for Fejo Havn can be obtained from Bandholm. See also section 7A-18.

7A-23 LILLEO and ASKO are low, flat islands lying about midway between Fejo and Stensore and are connected with each other by a causeway about 1/3 mile long. On Lilleo, the northern and smaller of the two islands, are several houses, and on the northern part of Asko is a small village with a white church surrounded by trees.

A shorebank with depths of less than 1 fathom surrounds Lilleo and Asko. Konemades Hage, which is rocky, extends about 1/2 mile westward and west-southwestward from the southwestern extremity of Asko; its western side is marked by a spar buoy moored in a depth of 2 fathoms. A 5-foot rocky patch lies about 1 1/2 miles eastward of the northern extremity of Asko. Between Asko and Stensore, about 2 1/2 miles southeastward, the depths do not exceed 2 fathoms and in some places are only about 1 foot.

ASKO HAVN, located on the southern side of Asko near the southwestern extremity of the island, is a small offshore harbor which is connected with the shore by a causeway. The depth in the harbor is 2.5 m (8.2 ft.), and alongside the head of the pier it is 3.0 m (9.8 ft.). Northeasterly and southwestward winds respectively raise and lower the water level as much as 3 feet. A light is shown on the pier from 1 September to 1 March. A light is shown on each side of the harbor entrance from 1 August to 31 March. The light on the pier in range with the light on the western side of the entrance leads to the harbor. A can buoy is moored about 1/2 mile south-southwestward of Asko Havn during the winter.

FEMO SUND, the channel between Fejo and Femo, is entered from northward between the flat lying from 1 1/2 to 2 1/2 miles east-southeastward of the northeastern end of Vejro and that lying nearly 1 1/2 miles west-northwestward of the northern extremity of Femo; these flats are described in section 7A-11.

There are depths of 10.0 to 14.0 m (5.4 to 7.6 fm) in the northern entrance of the sound and as far southward as Darrehøj Flak, which extends nearly 1 mile westward from the western extremity of Femo to the 3-fathom curve. The western extremity of Darrehøj Flak is marked by a spar buoy. Farther southward the depths decrease, and for about 1 mile northward of the southern entrance, which lies eastward of Fejo Sletter, the channel has irregular depths of 2 to 4 1/2 fathoms. A wreck with a depth of 4 3/4

fathoms lies about 2 3/4 miles northwestward of the western extremity of Femo. Two rocky patches, each with a least depth of 1 fathom, lie on the eastern side of the southern part of the channel; the western sides of these patches are marked by two spar buoys moored about 1 mile east-northeastward and northeastward, respectively, of Fejo Sletter.

After passing through Femo Sund from northward, a small vessel can proceed through the channel across the flat between Fejo and Lilleo to Staalby, or it can steer for a channel which leads eastward about 3/4 mile southward of Femo and can pass through this channel to the fairway of the northern approach to Guldborg Sund. Depths of not more than 10 feet can be relied on in either of these channels. Local knowledge is essential for the navigation of Femo Sund.

7A-24 FEMO HAVN (54° 58' N., 11° 31' E.) is situated about 3/4 mile southeastward of the western extremity of Femo. It is formed by a mole which extends southwestward from the shore, and a breakwater which extends south-southeastward from the head of the mole and then turns northeastward for a short distance. A weed trap projects about 50 yards southwestward from the head of the mole.

The harbor entrance, which faces south-eastward, is approached from Femo Sund by a dredged channel marked by spar buoys on its southern side. A rock with a depth of 2.6 m (1.4 fm) lies immediately westward of the outer end of the dredged channel. The channel and the greater part of the harbor have depths of 3.0 m (9.8 ft.). The water level may be raised about 5 feet by northerly winds and lowered the same amount by southerly winds.

Two range lights are shown on the coast a short distance east-southeastward of the harbor. These lights in range 098° lead through the approach channel to a position close south-southwestward of the harbor entrance. A light is shown at the southern angle of the breakwater.

There is anchorage for small vessels in a depth of 2 1/2 fathoms about 1/2 mile westward of the harbor. Local pilots are available.

Small amounts of provisions and water are available.

FEMO SLETTEREV, on which are depths of less than 1 fathom, extends about 3/4 mile southward from Femo Sletter, the southern point of Femo. The southern extremity of Femo Sletterev is marked by a spar buoy. Gronvold Grund, a 1-fathom rocky patch, lies close eastward of the southern end of Femo Sletterev and nearly 3/4 mile south-southeastward of Femo Sletter. A 1 1/4-fathom rocky patch lies about 1 1/2 miles southwestward of Femo Sletter.

STEMMETOFTE, with depths of less than 1 fathom, lies about midway between Femo and Vigsnaes; there is a drying rock on its southeastern part. The northwestern extremity of Stemmetofte is marked by a spar buoy. There is a channel with a least depth of 10 feet between Femo Sletterev and Stemmetofte; its direction for buoyage purposes is from west to east.

SKELLEREV extends about 1 3/4 miles eastward from Andemose Naake (sec. 7A-11) to the 3-fathom curve on the western side of the northern approach to Guldborg Sund. A narrow sandbar that is above water at mean water level lies on the middle of this reef. A 2 3/4-fathom rocky patch lies about 2 miles eastward of Andemose Naake and is marked by a light buoy moored on its eastern side in a depth of 3 1/4 fathoms.

Southward of Skellerev there is good anchorage, especially during westerly and northerly winds, in depths of 3 1/4 to 5 fathoms. Vessels should anchor as close to the southeastern coast of Femo as the draft permits. Two wrecks, each having a depth of 4 fathoms, lie respectively about 2 1/3 and 2 2/3 miles eastward of Femo Sletter, and a wreck with a depth of 2

fathoms lies about 2/3 mile east-southeastward of the same point.

STAALDYB AND LINDHOLM DYB

7A-25 Staal dyb is the channel between the flats extending from Raago and Lolland on the southwest and those extending from Skalo and Fejo on the northeast. It leads in a general southeasterly direction from its northwestern entrance, about 3 miles westward of the southwestern end of Vejro, to a position about 1 mile southward of Fejo. This channel has depths of 10.0 to 17.0 m (5.4 to 9.3 fm), except for a 6.5 m (3.5 fm) patch lying about 3/4 mile northward of Raago. There are passages with depths of 7 fathoms on both sides of the 3 1/2-fathom patch. The sides of Staal dyb are mostly steep-to. The edges of the flats bordering the channel are usually indicated by light-colored water and by rips.

The channel is marked in accordance with the Danish uniform system, some of the buoys being equipped with reflectors. A buoy with a topmark consisting of a ball painted in red and black vertical stripes is moored about 3 miles westward of the southwestern extremity of Verjo marks the northwestern entrance of Staal dyb; it also marks the southern entrance of the deep channel westward of Vejro Vestre Flak (sec. 7A-11) and the eastern approach to the passage southward of Omo Staalgrunde (sec. 2C-7).

LINDHOLM DYB, a continuation of Staal dyb, leads eastward for about 1 mile from the southeastern end of the latter channel, passing northward of Stenhjelm, and then turns south-eastward and passes between Lindholm Rev and Konemades Hage; it ends about 3/4 mile south-southwestward of Asko Havn. There is a channel with depths of over 5 fathoms in the fairway of Lindholm Dyb, but it is too narrow and tortuous to be followed.

In addition to the buoys mentioned with the descriptions of the dangers adjacent to Lindholm Dyb, there are two spar buoys marking the northern side of the fairway in positions

about 1 mile south-southeastward and $1\frac{1}{2}$ miles southeastward, respectively, of Avernakke.

Pilots for Staal dyb and Lindholm Dyb.—See section 7A-18.

Directions for Staal dyb and Lindholm Dyb.—From the buoy marking the northwestern entrance of Staal dyb a vessel should steer to pass northeastward of the conical buoy marking the northeastern side of Raagø Flak and southwestward of the can buoy on the northeastern side of the channel abreast Fejø Staalgrund. When near the spar buoy moored on the southwestern side of the channel and about $\frac{1}{2}$ mile northward of Raagø, the vessel should steer for Bandholm Church, bearing about 149° , which leads through the remainder of Staal dyb in depths of not less than $3\frac{1}{4}$ fathoms. As this course passes very close to the steep-to shorebank on the western side of Fejø and very close westward of Avernakke Hage, it should be altered as necessary in order to clear these dangers and to keep westward of the buoys marking them.

After rounding the buoy marking Avernakke Hage and entering Lindholm Dyb, the vessel should steer for the church on Askø, bearing about 099° . This course passes very close northward of a $2\frac{1}{2}$ -fathom patch and a $2\frac{3}{4}$ -fathom patch lying about $1\frac{1}{2}$ miles northwestward of Lindholm. When past the buoy on the northern side of the fairway about $1\frac{1}{2}$ miles southeastward of Avernakke, the vessel should steer to pass between the buoys marking Lindholm Rev and Konemades Hage, taking care to clear the shorebank northward of Lindholm, and thence should steer a more southerly course for the entrance of Bandholm Rende.

ANCHORAGES

7A-26 Agersø Sund.—See section 7A-6.

Omø Sund.—See section 7A-8.

Bisserup Red.—See section 7A-15.

Karrebæksminde Red.—See section 7A-15.

Channel between Fejø and Lillesø.—See section 7A-22.

Off Femø Havn.—See section 7A-24.

Southeastward of Femø.—See section 7A-24.

Part B. GULDBORG SUND

7B-1 Vigsø ($54^\circ 55' N.$, $11^\circ 38' E.$), on the southwestern side of the northern entrance of Guldborg Sund, is described in section 7A-20. The northern boundary of the sound is a line drawn from Vigsø round some patches lying up to $1\frac{2}{3}$ miles northward and 2 miles north-northeastward of that island to Suderø (sec. 7B-6).

GENERAL REMARKS

7B-2 Guldborg Sund, the passage separating Lolland from Falster, is used mainly by traffic proceeding between its northern approach and Nykøbing, which is located on Falster about 12 miles southeastward of the northern entrance of the sound. Nykøbing can be reached from northward in a least depth of 20 feet. Guldborg Sund can be navigated only by day. For buoyage purposes, vessels are considered to be entering the sound when approaching from northward.

The southern approach to Nykøbing is described in section 5B-5.

CURRENTS

7B-3 During settled weather the tidal currents in Guldborg Sund change direction regularly and have a rate of 1 to 2 knots. When the weather is unsettled, especially just after the onset of strong southeasterly winds, a north-going current may continue for several consecutive days, and in the narrower parts of the channel it may attain a rate of as much as 4 knots.

ICE

7B-4 The average period during which ice is present in the northern approach to Guldborg Sund and in the fairway of the sound north-

ward of Nykøbing extends from the early part of January to late February or early March. Ice may form in these waters as early as the middle of November, and it may not disappear until the first or second week of April. The channel is seldom free of ice throughout the winter. An icebreaker is available.

PILOTAGE

7B-5 A vessel bound for Nykøbing from northward can obtain a pilot for Guldborg Sund from the pilot station at Guldborg. This station also provides pilots who will take vessels to Grønsund and through the western part of Smaalands Farvandet and the southern part of Store Bælt. A pilot from another station in Smaalands Farvandet will take a vessel past Femø until, after making a signal, she is met by the Guldborg pilot, who will take her to Nykøbing. If a vessel bound for Guldborg via the main fairway in the western part of Smaalands Farvandet requires a pilot from Guldborg, and has no other pilot aboard, she should arrange in advance for the Guldborg pilot to board northward of Skellerev (sec. 7A-24).

Pilots for the southern part of Guldborg Sund can be obtained at Nykøbing.

Because of the narrow, winding channel and the strong currents a vessel should not attempt to navigate the sound without a pilot.

See also section 7-6.

NORTHERN APPROACH AND ENTRANCE TO GULDBORG SUND

7B-6 The northern entrance to Guldborg Sund lies between Vigsø and Vigsnæs (sec. 7A-20) on the southwest, and Suderø and the northwestern part of Falster on the northeast and east.

At Guldborg, about 4 miles southeastward of Vigsø, the northeastern side of Vigsnæs approaches the Falster coast and narrows the sound there to a width of only about 200 yards. Westward of Guldborg the land is thickly wooded.

Vigsnæs Church and Taars Church, which are described in section 7A-18, are visible from the approach and entrance. Majbølle Church, a red building with a stepped tower, is located about $2\frac{1}{4}$ miles southward of Guldborg.

On the eastern side of the entrance there is a bight in the Falster coast between the point on which Resleskov (sec. 7A-12) is situated and Alstrup Klint, nearly $2\frac{1}{2}$ miles south-southeastward. The shores of this bight are low, but Alstrup Klint has a height of about 20 feet. Prominent objects on Falster which can be seen from the northern approach to the sound are Vaalse Church and Kippinge Church, described in section 7A-12, and Brarup Church and Stadager Church, located respectively $1\frac{1}{2}$ and $2\frac{3}{4}$ miles south-southeastward of Kippinge Church.

Several pole beacons with topmarks are located on both sides of the passage for the use of the pilots.

Guldborg Sund is approached from northward between Skellerev and **Kogrund**, a rocky flat lying on the outer part of the shorebank which extends about $3\frac{1}{2}$ miles west-northwestward from the Falster coast immediately south-southwestward of Vaalse Vesterskov (sec. 7A-12). Kogrund has a least depth of 5 feet; its northwestern side is marked by a spar buoy moored in a depth of $2\frac{1}{2}$ fathoms and its southeastern side is marked by a spar buoy moored in a depth of $1\frac{1}{2}$ fathoms. A 2-fathom patch lies close southward of Kogrund.

Suderø Flak extends about 2 miles west-northwestward from the southwestern part of the peninsula forming the northwestern extremity of Falster. This flat is strewn with rocks and has depths of less than 1 fathom up to nearly $1\frac{1}{4}$ miles from the shore. A spar buoy is moored on the northwestern part of Suderø Flak in a depth of $1\frac{3}{4}$ fathoms. **Suderø**, a flat islet, lies on Suderø Flak and about $\frac{1}{2}$ mile off the northwestern side of Resleskov.

Ledagrund, a patch having depths of less than 3 fathoms, lies close westward of Suderø

Flak and about 1 mile west-southwestward of Suderø. A spar buoy is moored on this patch in a depth of 2 fathoms close westward of a rock with a depth of $1\frac{1}{4}$ fathoms.

A group of rocky patches with depths of $1\frac{1}{2}$ to $2\frac{3}{4}$ fathoms lies on the western side of the fairway west-southwestward of Ledasgrund and from $1\frac{1}{3}$ to $1\frac{2}{3}$ miles northward of Vigsø. The northernmost patch, which has a depth of $2\frac{1}{2}$ fathoms, is marked by a spar buoy moored in a depth of $3\frac{3}{4}$ fathoms.

Wrecks.—See section 7A-24.

7B-7 Entrance channel.—From the fairway between Ledasgrund and the patches west-southwestward the channel into Guldborg Sund leads in a general southeasterly direction to the narrows at Guldborg, passing between the shorebanks extending from Lolland and Falster. Vigsø Flak, the outer part of the flat extending north-northwestward from Vigsø, is described in section 7A-20.

The shorebank bordering the northeastern side of Vignæs extends up to $1\frac{2}{3}$ miles from the coast to the 3-fathom curve on the southwestern edge of the channel. Vigsø Skæl, a rocky patch with a least depth of $1\frac{1}{2}$ fathoms, lies on the outer part of this shorebank and northeastward of Vigsø; its northeastern side is marked by a spar buoy moored in a depth of 2 fathoms. Argusgrund consists of two rocky patches lying on the edge of the shorebank in positions about $1\frac{1}{2}$ miles east-northeastward and $1\frac{3}{4}$ miles eastward of Vigsø; the northwestern patch has a depth of $1\frac{1}{2}$ fathoms, and the southeastern patch has a depth of $1\frac{3}{4}$ fathoms and is marked by a spar buoy.

On the Falster side a bank extends up to $1\frac{1}{2}$ miles from the shores of the bight between Resleskov and Alstrup Klint to the northeastern side of the channel. Several patches with depths of $1\frac{1}{4}$ to 2 fathoms lie close inside the 3-fathom curve on this side.

A $2\frac{1}{2}$ -fathom patch, its eastern side marked by a spar buoy with a reflector, lies in mid-

channel about 2 miles north-northwestward of Guldborg.

Off Alstrup Klint a portion of the fairway is dredged to a depth of 6.2 m (20.3 ft.). This dredged channel is marked by two spar buoys on its western side and one spar buoy on its eastern side.

Alstrup Rev, composed of rock and sand, extends about $\frac{1}{4}$ mile from the Falster coast at the southern end of Alstrup Klint and is marked by two spar buoys. From Alstrup Rev to Guldborg Bridge the shorebank is narrow and steep-to.

Havrehesten, a reef with depths of less than 1.5 m (4.9 ft.), extends about $\frac{1}{3}$ mile northward from a point on the Lolland coast close northward of Guldborg. Two spar buoys moored just outside the channel mark the northern end and the eastern side of this reef. The shorebank between Havrehesten and Guldborg Bridge is steep-to.

Directions.—From a position about 2 $\frac{1}{2}$ miles northeastward of Andemose Nakke a vessel bound for Guldborg Sund should steer for Taars Church on a bearing of 178° , which leads between Skellerev and Kogrund in depths of not less than 4 fathoms. When Stadager Church and a conspicuous notch in Alstrup Klint are in range about 130° , the vessel should steer on this range, which leads in a least depth of 4 fathoms between Ledasgrund and the group of rocky patches lying from $1\frac{1}{3}$ to $1\frac{2}{3}$ miles northward of Vigsø and thence leads between the Falster shorebank and Argusgrund.

After passing Argusgrund a vessel can proceed through the remainder of the channel to Guldborg with the aid of the buoys, but local knowledge is necessary.

GULDBORG SUND—GULDBORG TO NYKØBING

7B-8 Guldborg ($54^\circ 52' N.$, $11^\circ 45' E.$) is situated on both sides of Guldborg Sund, the

main part being on Lolland. The fairway of the sound at Guldborg has depths of 6 to 9 fathoms. A pier with a depth of 4.0 m (13.1 ft.) at its head extends southeastward from the shore at the northern end of Guldborg village on the Lolland side. On the Falster side is a short wharf with a depth of 3.5 m (11.4 ft.) alongside and 13 feet about 8 feet off its face. There are various facilities for boats. Northerly and northeasterly winds may raise the water level about 3 1/4 feet, and southerly and southeasterly winds may lower it about 1 1/2 feet. Pilots are stationed on the Falster side; see also section 7B-5. Provisions and water can be obtained. A machine shop is available.

Guldborg Bridge, which crosses the sound at Guldborg, is a road bridge with a double-leaf bascule span between two piers in the central part of the fairway. The horizontal clearance in the navigable passage through the bridge is about 98 feet, and the vertical clearance between the bascule span when closed and mean water level is about 13 feet. **Lights** mark both sides of the opening.

Vessels can pass through the bridge without charge at any time from sunrise (between 1 November and 1 March, from 1/2 hour before sunrise) to 1/2 hour after sunset. Under exceptional circumstances the bridge may be opened at night if arrangements are made with the bridgmaster during normal service hours and a fee is paid.

A vessel desiring to pass through the bridge should, when not less than 1/2 mile from it, make the following **signals**:

By day.—The International Code flag “N” or, if this is not available, the national ensign, either being hoisted at half-mast on the foremast; also one long blast and one short blast of the whistle or foghorn.

At night.—A white light at the bow and the same sound signal as that made by day.

These signals are answered by the following signals displayed from a mast on the bridge:

(a) One fixed red light; passage prohibited.

(b) Two flashing red lights, one over the other; southbound vessel prepare to pass through on signal (c).

(c) Two fixed red lights, one over the other; southbound passage permitted.

(d) Three flashing red lights, one over the other; northbound vessel prepare to pass through on signal (e).

(e) Three fixed red lights, one over the other; northbound passage permitted.

If the bridge cannot be opened after the display of one of the signals (b) thru (e), the signal will be replaced by (a) and a loud sound signal.

Until the signal permitting passage is received, a vessel must keep at least 110 yards from the bridge.

Only one vessel at a time may pass through the bridge. Vessels under sail take precedence over steam and motor vessels.

A vessel approaching the bridge must have an anchor ready for letting go. Boats, davits, and other obstructions must be rigged in to avoid fouling the bridge.

When within 110 yards of the bridge, a vessel must not proceed at a speed greater than that which is necessary for maneuvering.

Anchoring within 220 yards of the bridge is prohibited except in an emergency, such as danger of collision with the bridge. If anchoring outside this area, care must be taken to avoid lying in the fairway or so close to it that, when swinging, other vessels will be obstructed in their approach to the bridge.

Vessels are prohibited from making fast to the bridge.

Submarine cables are laid across the passage through the bridge and across the sound close southward of the bridge. The directions of these cables are indicated by **range beacons**.

CHANNEL FROM GULDBORG TO NYKOBING.—A narrow, winding channel leads from Guldborg to Nykobing, about 7 1/2 miles south-southeastward, passing between shallow shorebanks on both sides. The narrowest part of the channel lies off Hjelms Nakke, a point on the Lolland side about 2 3/4 miles south-southeastward of Guldborg. Vessels can proceed between the northern entrance of Guldborg Sund and Nykobing in depths of not less than 6.2 m (20.3 ft.). Anchoring in the channel is prohibited.

The channel is buoyed in accordance with the Danish uniform system. Several pole beacons for the use of the pilots stand on both sides of the sound. Two range lights are shown at Nykobing; these lights in range 145° lead through a narrow part of the channel immediately northwestward of the harbor.

Two submarine cables cross the channel off Hjelms Nakke, and another submarine cable crosses about 1 3/4 miles southward of that point. The direction of each cable is indicated by a pair of lighted range beacons, the northern being on the Falster side and the southern on the Lolland side. A submarine cable crosses the channel about 2 miles northwestward of Hjelms Nakke.

Several piers with depths of 6 to 11 feet at their heads extend from the shores of the sound between Guldborg and Nykobing.

As local knowledge is essential for navigating Guldborg Sund, no directions for this part of the channel are given.

NYKOBING

Position: 54°46'N., 11°52'E.
Depths: Northern approach, 6.2 m (20.3 ft.).
 Southern approach, 2.1 m (6.5 ft.).
 Yacht and fishing harbor, 2.0 m (6.5 ft.).
 Nordhavnen, 5.3 m (17.3 ft.).
 Gamle Havn, 4.2 m (13.7 ft.).
 Berths at marginal quays, 5.3 to 6.3 m (17.3 to 20.6 ft.).
Tidal range: 1 1/4 feet.

7B-9 The port of Nykobing is situated near the middle of the eastern side of Guldborg Sund. It is the principal port on Falster. The harbor comprises the greater part of the fairway fronting the town, marginal quays along the eastern side of the fairway, and three small basins.

TIDES AND WATER LEVEL.—The mean range of tide at Nykobing is 1 1/4 feet. Gales between northwest and northeast may raise the water level as much as 5 feet, and those between southeast and southwest may lower it about 2 1/2 feet.

CURRENTS.—Strong winds between northwest and northeast cause a southgoing current, and those between southeast and southwest cause a northgoing current. See also section 7B-3.

ICE.—See table 5 in chapter 1 for ice information.

HARBOR.—The largest of the three basins mentioned above is located at the northern end of the port area. It is protected on its northwestern and western sides by a breakwater and has an entrance about 100 feet wide. The northern part of this basin has a uniform depth of 2.0 m (6.5 ft.) and is used mainly by yachts and fishing craft. The southern part, Nordhavnen, lies immediately within the entrance and is dredged to a depth of 5.3 m (17.3 ft.). Gamle Havn, a basin with a depth of 4.2 m (13.7 ft.), is located about midway along the Nykobing waterfront. Nordhavnen and Gamle Havn accommodate small coasting vessels and boats. Søndre Baadehavn, at the southern end of the port area, is a narrow basin with depths of 1.6 m (5.2 ft.); it is used principally by lighters.

Quays extend along the eastern side of the sound between Nordhavnen and King Frederik IX Bridge. A dredged section of the fairway of the sound fronts the quays and basin entrances northward of King Frederik IX Bridge. This area has a least depth of 20 1/2 feet and an average width of about 450 feet. A shoal with a least depth of 1.5 m (4.9 ft.) lies about 60 yards off the quay close northward of King Frederic IX Bridge; it is marked by three spar buoys.

LIGHTS.—See section 7B-8.

BRIDGES.—Two bridges cross Guldborg Sund close southward of Gamle Havn. The northern bridge is abandoned; bridge piers and the western approach causeway remain. King Frederik IX Bridge, the southern bridge, is a highway and railroad bridge having a lighted bascule span opening 65 feet wide and a vertical clearance of 13 feet when the span is closed; a fog signal is sounded. Submarine cables are laid along each side of the bridge.

The regulations and signals governing the passage of vessels through King Frederik IX Bridge at Nykobing are the same as those for Guldborg Bridge (sec. 7B-8) except for the following changes and additions:

The bridges are opened without charge between 0600 and 1200 and between 1330 and 1800 from 1 April to 30 September; from 1 October to 31 March they are opened between sunrise and sunset. Except during these periods, the bridges will be opened only when arrangements have been made with the bridge authorities and charges have been paid.

Flashing red light bridge answering signals are not displayed.

Until the signal permitting passage is received, a vessel must keep at least 1/4 mile from the bridge.

When a vessel is within 273 yards of the bridge, speed must be reduced to the minimum required for maneuvering.

Anchoring within 273 yards of the bridge is prohibited except in an emergency.

Pilots are stationed at Nykobing. They will take vessels southward to the Baltic entrance of Guldborg Sund and northward to Guldborg. See also section 7B-5.

NYKOBING, the largest town on Falster, has a population of about 20,692 in 1965. It is a commercial and industrial center and an important railroad junction. The industries of the town include food processing, sugar refining, and manufacturing electrical and woodworking machinery. The principal com-

modities discharged at the port are coal, fertilizer, feedstuffs, sugar beets, iron, and timber; shipments are mainly grain and sugar. Nykobing is a first port of entry; the customhouse is located near the southern end of Gamle Havn.

Nordhavnen has 820 feet of quayage with a depth of 5.3 m (17.3 ft.) alongside; the length of the longest quay in the basin is 325 feet. The quay between the entrances of Nordhavnen and Gamle Havn is 1,000 feet long and has a depth of 6.2 m (20.3 ft.) alongside. Gamle Havn has 1,450 feet of quayage with depths up to 4.2 m (13.7 ft.) alongside. The quay southward of Gamle Havn is about 1,300 yards long and has 5.3 to 6.3 m (17.3 to 20.6 ft.) alongside.

The quays are served by rail lines connecting with the general system. A tug is available. There are two bridge transporters for handling coal, one 6-ton crane, and three grain elevators in the port.

Provisions can be obtained. Water is piped to the quays. Petroleum for small motor vessels and coal are available. Minor repairs can be made by machine shops in the town. Several railroad lines connect Nykobing with all parts of Denmark.

ANCHORAGE

7B-10 SOUTHEASTWARD OF FEMO.—See section 7A-24.

Part C. EASTERN PART OF SMAALANDS FARVANDET

7C-1 ORE LIGHT (55°00'N., 11°52'E.) is shown on the south coast of Sjælland in a position about 1 1/4 miles westward of Vordingborg Church (sec. 7A-9). This light is a guide for approaching Masnedsund (sec. 7C-6) and Storstrom (sec. 7C-13) from westward.

GENERAL REMARKS

7C-2 Eastward of Bredegrund (sec. 7A-13) and **Dyrefod Flak** (sec. 7A-12) the fairway divides into two passages. The northern passage leads along the south and east coasts of

Sjælland and into the Baltic Sea through a channel across the flats in the western part of Fakse Bugt (see H. O. Pub. No. 41). The southern passage leads along the north coast of Falster and into the Baltic Sea off the eastern extremity of that island. The passages are separated from each other by Møn and several smaller islands, and by extensive flats adjacent to these islands. There are several secondary channels branching from the main fairways of both passages.

The main fairways and some of the secondary channels are marked by buoys in accordance with the Danish uniform system. Eastward of the bridge across Masnedsund and southeastward of a line joining the northern extremity of Orehoved (sec. 7A-12) and the western extremity of Masnedø (sec. 7C-6) the buoyage throughout the two passages changes, and vessels are considered to be entering when approaching from the Baltic Sea. Some of the buoys are equipped with reflectors.

The only portions of the northern passage having lighted navigational aids are Masnedsund and its western approach, the channel across the flats at the Baltic entrance, and the navigable passages of two bridges that cross the fairway. Lights are also shown at a few small harbors and at the landing places of some of the submarine cables laid across the fairway. The southern passage is lighted throughout.

The principal ports in the eastern part of Smaalands Farvandet are Masnedsund; Stege, on the northwestern side of Møn; and Stubbekøbing, on the north coast of Falster.

DEPTHS

7C-3 Vessels from westward can proceed through the northern passage as far as the bridge across Masnedsund in a least depth of 23 feet, and to the eastern quay on the northern side of Masnedsund in a least depth of 20½ feet. Between Masnedsund and Kalvehave Havn, at the southeastern extremity of Sjælland, there

is a least depth of 4.4 m (14. 4 ft.) in the main channel. Stege can be reached from the fairway off Kalvehave Havn in a least depth of 4.1 m (13.4 ft.). Between the approach channel to Stege and the Baltic entrance of the northern passage a depth of not more than 8 1/2 feet at mean water level can be relied on.

In the southern passage vessels from westward can reach Stubbekøbing in a least depth of 19 feet, and can proceed thence into the Baltic Sea in a least depth of 16 feet.

CURRENTS

7C-4 Information regarding currents in the passages through the eastern part of Smaalands Farvandet is given with the descriptions of the various parts of these passages in sections 7C-6, 7C-8, 7C-11, 7C-13, and 7C-15.

ICE

7C-5 See section 7-5.

NORTHERN PASSAGE

7C-6 The northern passage comprises the following parts: Masnedsund, the western section, between Sjælland and Masnedø; Færgestrøm, between Sjælland and the flat connecting Masnedø and Farø; Ulvsund, between Sjælland and Langø on the one side and Lilleø, Tærø, and Møn on the other; and Bøgestrøm, the northeastern section, between Sjælland and Nyord.

Local knowledge is essential for the navigation of the northern passage.

Pilots.—A pilot stationed on Masnedø will take vessels eastward through the northern passage. The Masnedø pilot will also pilot vessels to Grønsund, in the southern passage and to Hestehoved Dyb; through the western part of Smaalands Farvandet; and in the southern part of Store Bælt. Vessels approaching the western entrance of the northern passage and requiring

a pilot are met near the outer end of the dredged channel leading into Masnedsund.

Masnedsund.—The northern side of Masnedsund is formed by **Oringe**, a peninsula on the Sjøælland coast; Oringe Pynt, the southeastern extremity of the peninsula, lies nearly 2 miles east-southeastward of Ore Light. On the southern side of Oringe is the town of Masnedsund and the quays and basin of Vordingborg Sydhavn. Oringe Hospital, a large group of buildings surrounded by woods, is located on the eastern part of the peninsula.

On the southern side of the sound is **Masnødø**, a low island lying with its northern extremity nearly $\frac{3}{4}$ mile southeastward of Ore Light; the least width of the passage between Masnødø and Oringe is about 175 yards. On the northern part of the island is Masnødøværket, an electric power plant with two conspicuous chimneys. Bridges connect Masnødø with Sjøælland and Falster.

The tidal currents in Masnedsund change direction regularly in settled weather and may attain a rate of 3 to 4 knots. During stormy weather they become irregular, and a current may set in the same direction for several consecutive days. Westerly and northwesterly gales cause an eastgoing current, and easterly and southeasterly gales cause a westgoing current; the rate may be as much as 5 knots.

The western entrance of Masnedsund is a dredged channel leading east-southeastward from a position nearly $\frac{1}{2}$ mile west-southwestward of Ore Light to the northern extremity of Masnødø. This channel has a depth of 23 feet and a width of about 100 feet. On its northern side is the shorebank extending from Sjøælland, and on its southern side is **Masnødø**

Nordvest Flak, which extends about $\frac{3}{4}$ mile west-northwestward from the western extremity of Masnødø. Two patches, with depths of 5.5 and 4.3 m (3.0 and 2.3 fm), lie off the channel entrance in positions nearly 1 mile and $\frac{2}{3}$ mile, respectively, westward of Ore Light. The former patch is marked on its southern side by a spar buoy and the latter is marked on its northern side by a conical buoy. The sides of the dredged channel are marked by buoys; a light buoy is moored on the southern side in a position about $\frac{1}{3}$ mile southwestward of Ore Light.

Two pairs of **range lights** lead through the western entrance channel. The lights on one pair are shown on the northern end of Masnødø and in range 119° lead through the western part of the channel as far as the light buoy. The front light of the other pair is shown on a pier of Masnedsund Bridge and the rear light is shown on the northern side of the sound; these lights in range 113° lead from the light buoy to the quay at Masnødøværket.

High tension **overhead cables** with a clearance of 118 feet cross the eastern end of the dredged channel.

From Masnedsund Bridge the eastern part of Masnedsund leads east-southeastward for about 2 miles between shallow flats extending from Masnødø and Oringe. **Flyndergrund**, with a depth of 1.8 m (5.9 ft.) extends about 300 yards from the southern side of Oringe close eastward of the southeastern quay at Vordingborg; its southern side is marked by a spar buoy. **Trellegrund**, on which are depths of less than 1.9 m (6.2 ft.), extends about 1 mile southeastward from Oringe Pynt. Flyndergrund and Trellegrund form the northern side of the eastern part of Masnedsund. Masnødø Oster Flak, which forms the southern side of the eastern part of the sound, is the western portion of a flat that connects Masnødø with Faro. The northwestern part of Masnødø Oster Flak has depths of less

than 6 feet for about $3/4$ mile eastward of Masnedø except in a short dredged and buoyed channel, with a depth of 2.2 m (7.2 ft.), leading southward from Masnedø about $1/2$ mile eastward of the island.

A 2-fathom patch and a $1\frac{1}{4}$ -fathom patch, the latter marked by a spar buoy, lie in the fairway of Masnedø about $1/2$ and $2/3$ mile, respectively, east-southeastward of the northeastern extremity of Masnedø. The southern side of Masnedø eastward of the dredged channel across the northwestern part of Masnedø Øster Flak is marked by three spar buoys.

Two **range lights** are shown on the northeastern extremity of Masnedø. These lights in range 294° lead through the eastern part of Masnedø in a least depth of 10 feet. They are not shown when the channel is blocked by ice. **Range lights** for the dredged channel across Masnedø Øster Flak are shown on the southern side of Oringe.

7C-7 Masnedø Bridge crosses Masnedø between the northwestern end of Vordingborg Sydhavn and the northern side of Masnedø. This road and railroad bridge has a bascule span with a navigable opening 82 feet wide. The minimum vertical clearance when the bridge is closed is $15\frac{1}{2}$ feet at mean water level. Both sides of the navigable opening are marked by **lights**.

Vessels can pass through the bridge without charge from sunrise (between 1 November and 1 March, from $1/2$ hour before sunrise) to $1/2$ hour after sunset, except when a train is expected to cross. In exceptional circumstances the bridge will be opened at other times, provided that arrangements are made in advance with the bridgmaster.

The **signals** to be made by vessels desiring passage through Masnedø Bridge are the same as those described for use at Guldborg Bridge in section 7B-8.

In answer to the signals made by approaching vessels, the following signals, both by day and at night, are displayed on the bridge:

(a) One red light, indicating that passage is prohibited.

(b) Two red lights, indicating that west-bound vessels can pass through.

(c) Three red lights, indicating that east-bound vessels can pass through.

(d) A violet light shown with signals (b) or (c), indicating that vessels must warp through the bridge.

By day, along with the light signals (a), (b), and (c), there are displayed respectively one, two, and three balls; and along with the violet light in signal (d) is displayed a blue flag.

A loud sound signal from the bridge indicates that, although a signal for passage has been given, the bridge cannot be opened. As soon thereafter as circumstances permit, the passage signal will be removed and signal (a) will be made.

Until a vessel receives a signal permitting passage, she must keep at least 440 yards from the bridge.

When a vessel is within 275 yards of the bridge, she must reduce speed to the minimum required for maneuvering, and she must not anchor except in an emergency.

Only one vessel at a time may pass through the bridge. Vessels under sail take precedence over steam and motor vessels. A vessel approaching the bridge must have an anchor ready for letting go. Vessels are prohibited from making fast to the bridge.

Submarine cables, marked by **beacons** and notice boards, are laid across Masnedø on both sides of the bridge.

Masnedø Havne.—The port of Masnedø comprises Masnedøværkets Havn, on the

southern side of Masnedsund and close westward of the bridge, and Vordingborg Sydhavn, on the northern side of the sound and immediately eastward of the bridge.

Masnedsøværkets Havn ($55^{\circ}00' N.$, $11^{\circ}53' E.$) fronts Masnedsøværkets and is used mainly by vessels discharging coal for the power plant. There is a quay with a length of 890 feet and a depth alongside of 23 feet. A turning area off this quay is 400 to 600 feet wide and has a least depth of 23 feet. The mean tidal range is about 1 foot. Northerly winds raise the water level and southerly winds lower it. Cargo-handling facilities consist of two $7\frac{1}{2}$ -ton bridge transporters for unloading coal and an 110-ton derrick. Water is laid on to the quay.

Vordingborg Sydhavn is owned by the town of Vordingborg, which is situated nearly 1 mile northeastward of Masnedsund Bridge. Immediately northward of the harbor is the small town of Masnedsund, a suburb of Vordingborg. The principal berthing facilities of Vordingborg Sydhavn are two quays along the Sjælland side of the sound northwestward and southeastward of the entrance of a small basin for fishing craft. The northwestern quay, situated between the bridge and the entrance of the basin, is 520 feet long and has a depth alongside of 7.0 m (22.9 ft.). The quay southeastward of the basin is 820 feet long and has depths alongside of 5.6 to 6.3 m (18.3 to 20.6 ft.). The depths in the basin are 2.5 m (8.2 ft.).

The quays are served by rail. On the southeastern quay are two grain elevators and a bridge transporter. Provisions, water, and coal can be obtained. Minor repairs to machinery can be made.

7C-8 Vordingborg Havn.—In addition to the port facilities at Vordingborg Sydhavn there is a small harbor fronting the southeastern part of Vordingborg. The approach to this harbor is between the northeastern side of Trellegrund and the shorebank bordering the Sjælland coast southeastward of Vordingborg. A

spar buoy marks the southeastern extremity of Trellegrund, and several spar buoys mark the approach channel to the harbor. The inner part of the channel is dredged to a depth of 2.5 m (8.2 ft.) and is very narrow.

A wharf at Vordingborg Havn has a length of 280 feet and depth alongside of about 2.4 m (7.8 ft.). At the eastern end of the wharf is a small pier, and eastward of that is a yacht basin. Gales between northwest and northeast may raise the water level about 4 feet, and those between southeast and southwest may lower it about $2\frac{1}{2}$ feet.

Two range lights are shown at Vordingborg Havn; in range 308° they lead through the dredged channel. A light is shown on the head of the pier at the eastern end of the wharf.

A pilot can be obtained from Masnedo. Vordingborg had a population of 11,905 in 1965. Provisions and water are available. In the town there are two machine shops. Vordingborg is connected by railroad with all parts of Denmark.

Færgestrøm.—The northern side of Færgestrøm, the section of the northern passage immediately eastward of Masnedsund, is bounded by the Sjælland shorebank, and the southern side is bounded by the flat connecting Masnedo with Faro. The depths in midchannel are 6.2 to 10.2 m (20.3 to 33.4 ft.), and the sides of the fairway are fairly steep-to. The northern side of the fairway is marked by a spar buoy.

From Vordingborg the coast trends in a general southeasterly direction to Stammenakke, the southern extremity of Sjælland. This stretch is fairly high and along it are several large woods. Some of the prominent objects within this part of the coast are described in section 7A-9. A red beacon surmounted by a white ball stands on the coast a short distance westward of Stammenakke.

The greater part of the flat which connects Masnedo with Faro has depths of 2.5 to 3.4 m (8.2 to 11.1 ft.), but there are several patches on it with depths of less than 8 feet. Two relatively deep blind channels enter respec-

tively the northern and southern sides of this flat; they are of no navigational importance. Small vessels with local knowledge can cross the flat in a least depth of 8 feet.

ULVSUND.—From the eastern end of Faergestrom, about 2 miles southeastward of Oringe Pynt, the northern passage continues eastward under the name of Ulvsund. The channel passes close southward of Stammenakke, between Taero and Lango, and thence northeastward between Kalvehave Pynt and Koster. After passing Kalvehave Pynt the navigable fairway leads northward to the southern entrance of Bogestrom.

The tidal currents in Ulvsund change direction regularly during settled weather. The rate varies between 1 and 4 knots. The currents are influenced to a large extent by the wind and are usually unpredictable.

Ulvsund is entered from Faergestrom through Ny Farvand, a narrow channel between the shorebank extending from Sjaelland and Skippergrund, which consists of several patches with depths of 2.0 to 2.4 m (6.5 to 7.8 ft.) on the northern side of a flat extending west-northwestward from Taero. Ny Farvand has a least depth of 4.4 m (14.4 ft.) and is marked on both sides by spar buoys. Kalvestrom, a deep but unmarked channel, branches southeastward from the fairway at the western end of Ny Farvand, passes northward of Faro and Bogo, and terminates southeastward of Taero.

The Sjaelland coast for about 3 miles northeastward of Stammenakke is thickly wooded. Kalvehave (Kallehave) Pynt, the southeastern extremity of Sjaelland, lies about 5 miles east-northeastward of Stammenakke; on the southern side of the point is Kalvehave Havn. Ulvsund Bridge crosses the fairway to Mon from a position close westward of Kalvehave Havn. Kalvehave Church, about 1 mile west-

ward of Kalvehave Pynt, is white and has a tower.

Between the eastern end of Ny Farvand and Petersvaerft Pier, nearly 3 1/2 miles eastward, the Sjaelland shorebank, which forms the northern side of the fairway, is narrow and steep-to. The shorebank between Petersvaerft Pier and Kalvehave Pynt extends up to 1 1/4 miles offshore, and on it lies Lango, which is connected with the coast of Sjaelland by a causeway.

The northwestern coast of Mon between Borgsted (sec. 7C-16), the southwestern extremity of the island, and Koster, a peninsula lying about 5 miles north-northeastward, has several indentations which afford access only to small craft; the northwestern extremity of Koster is about 1/2 mile southward of Kalvehave Pynt. Borren, a conspicuous hill 108 feet high, is located about 1 mile south-southwestward of the northwestern extremity of Koster.

7C-9 FARO, a low, treeless island on which are two farm houses, lies about 3 1/3 miles east-southeastward of Masnedo and southward of the western part of Ulvsund.

BOGO lies with its northwestern extremity about 1/3 mile southward of Faro, with which it is connected by a nearly drying flat. The eastern side of Bogo is connected with Mon by a shallow flat which is crossed by a causeway. Bogo is hilly and its eastern part is wooded. There are numerous houses and other buildings on the island. Bogo Church, which is gray and has a tower, stands on the northern part. Details of the western and southern sides of Bogo are given in sections 7C-15, 7C-16, and 7C-17.

SUBMARINE CABLES are laid between Bogo and Faro; they are marked at each landing place by a beacon.

TAERO lies nearly 2 1/4 miles eastward of Faro. There are some farm buildings on the central part of this island, and on the eastern part is a hillock 36 feet high. Two pairs of range beacons for the navigation of the channel northward of the island stand close northeastward of the hillock; the front beacons have crossbars, and the rear beacons are surmounted by balls.

A flat with depths of less than 2 fathoms extends about 3 3/4 miles west-northwestward from Taero, and Lilleo, a low islet, lies on it nearly 1/2 mile westward of Taero. Between Taero and Lilleo the flat dries at low water, and for about 1 1/3 miles west-northwestward of Lilleo it has depths of less than 6 feet. A conical buoy marks the southern side of a 7-foot patch lying about 1 1/2 miles west-northwestward of Lilleo. Skippergrund, on the western part of the flat, is described with Ny Farvand.

From Ny Farvand the fairway of Ulvsund leads between the shorebank bordering the Sjaelland coast and the flat extending west-northwestward from Taero until abreast the western extremity of the latter island. This part of the fairway has depths of 29 to 46 feet and is marked by several spar buoys.

An irregular shoal area, which is intersected by narrow unmarked channels, extends up to 2/3 mile from the northern side of Taero. Nordre Stenkar, a reef on the eastern side of this area, has a least depth of 2 feet. An 8-foot patch, its northwestern side marked by a spar buoy, lies on the southern side of the fairway and nearly 400 yards southwestward of Petersvaerft Pier; close north-northwestward of this patch and on the northern side of the channel is a 9-foot patch.

The main channel northward of Taero leads between the shorebank extending from Sjaelland and the shoal area mentioned above. About 1/2 mile east-northeastward of Petersvaerft Pier the channel turns southward, passing between Nordre Stenkar and the shorebank extending from Lango, and then leads eastward past the southwestern extremity of Lango. The sides of the channel are marked

by several spar buoys, and between Nordre Stenkar and the Lango shorebank they are indicated by the range beacons on the eastern extremity of Taero.

PETERSVAERFT PIER (54° 58' N., 12° 05' E.), on the Sjaelland coast abreast the middle part of Taero, has a depth of 7 1/2 feet at its head.

A submarine cable crosses Ulvsund from a position close westward of Petersvaerft Pier to Taero. Its direction is indicated by a pair of range beacons on Taero.

STENGRUND, an 8-foot patch lying nearly 1/4 mile southeastward of the southwestern extremity of Lango, is marked on its northern side by a spar buoy. The main fairway leads northward of Stengrund.

PLADEN, a 6-foot patch, lies on the southeastern side of the fairway and about 3/4 mile east-northeastward of Taero. The northern side of Pladen is marked by a can buoy.

Northeastward of Pladen the fairway widens, but it becomes narrow again off Koster, where it passes northwestward of a shoal ridge having a least depth of 7 feet and lying from 3/4 mile southwestward to 200 yards northwestward of the northwestern extremity of Koster. A spar buoy is moored on the northwestern side of this ridge and close southwestward of the central span of Ulvsund Bridge. A 6-foot patch lies on the southeastern edge of the fairway about 1/3 mile northeastward of the southeastern end of the bridge.

The northwestern side of the fairway is marked by several spar buoys between the southwestern extremity of Lango and Ulvsund Bridge and by another spar buoy nearly 1/2 mile northeastward of Kalvehave Havn.

SONDRE KNIGGE comprises two patches lying respectively about 3/4 mile northeastward and 1 mile east-northeastward of Kalvehave Pynt. The western patch has a depth of 7 feet and is marked on its western side by a spar buoy; the eastern patch has a depth of 6 feet. Nordre Knigge also comprises two patches, each of (continued on page 315)

which has a depth of 6 feet; the southern patch lies about 1 mile northeastward of **Kalvehave Pynt** and is marked on its eastern side by a **spar buoy**. A **spar buoy** is moored off the northeastern side of the northern patch of **Nordre Knigge** in a position about $1\frac{1}{2}$ miles north-northeastward of **Kalvehave Pynt**.

After passing **Kalvehave Pynt** the fairway turns northward and leads between **Søndre Knigge** and **Nordre Knigge**. As far as **Søndre Knigge** the depths in this part of the fairway are not less than 24 feet, but between **Søndre Knigge** and **Nordre Knigge** and thence northward to the southern entrance of **Bøgestrøm** the depths are only 8 to 9 feet.

7C-10 Ulvsund Bridge crosses the sound between a position on the **Sjælland** coast about $\frac{1}{3}$ mile westward of **Kalvehave Pynt** and the northwestern extremity of **Koster**. It is a fixed highway bridge with a navigable passage 394 feet wide under the central span. The maximum vertical clearance above mean water level is 85 feet. The middle of the central span and the sides of the navigable passage are marked by **lights** visible to vessels approaching from either direction. A **fog signal** is sounded from the bridge.

Only one vessel at a time may use the passage under the bridge. Vessels under sail take precedence over steam and motor vessels, and east-bound vessels take precedence over westbound vessels.

Anchoring within 330 yards southwestward and $\frac{1}{2}$ mile northeastward of the bridge is prohibited except in an emergency.

Several **submarine cables** are laid across the fairway immediately eastward of the bridge.

Kalvehave Havn comprises a small basin on the western side of a mole projecting southward from **Kalvehave Pynt** and an **L-head pier** extending southward and west-southwestward from the mole. The outer face of the head of the pier is about 150 feet long and has a depth of 12 feet alongside; the inner face is about 125

feet long and has a depth of 10 feet alongside. The depths in the basin are 1.8 to 2.8 m (5.9 to 9.1 ft.). Northeasterly gales may raise the water level about 3 feet, and southwesterly gales may lower it the same amount. A light is shown on the western end of the pierhead, and lights are shown on both sides of the entrance of the basin. Provisions and water can be obtained. The mole is connected with the **Sjælland** railroad system.

Submarine cables are laid between **Kalvehave Pynt** and the northern side of **Koster**. The eastern limit of the cable area is indicated by a pair of **lighted range beacons** on each coast.

Stege Bugt, between **Koster** and **Ulvshale**, the peninsula which forms the northern extremity of **Møn**, recedes southeastward for about 3 miles. The town and harbor of **Stege** are situated at the head of this bay. **Stege Church**, which has a spire, and a tall chimney at a sugar factory about $\frac{1}{3}$ mile southwestward of the church are prominent landmarks at the head of the bay.

The shorebank within the 1-fathom curve is fairly narrow on the southern side of the bay, except for a flat named **Gralen**, which extends about 1 mile north-northwestward from the coast immediately westward of **Stege**. **Rødstensnakke**, a projection of the shorebank on the eastern side of the bay, is marked by a **spar buoy** moored about 1 mile northwestward of the harbor entrance at **Stege**. Northward of **Rødstensnakke** the shorebank widens, and in the northern part of the bay it extends about $1\frac{1}{3}$ miles southwestward and southward from the southwestern extremity of **Ulvshale**. **Tyrholm**, a low islet, lies on this part of the shorebank about $\frac{1}{3}$ mile south-southwestward of the southwestern extremity of **Ulvshale**. A **spar buoy** moored about $1\frac{1}{4}$ miles southeastward of **Tyrholm** marks the outer end of the submerged remains of a pier extending across the shorebank from the northeastern side of the bay.

Lindholm, which has a height of 13 feet, lies in the middle of the outer part of Stege Bugt. A flat, on which are numerous rocks, surrounds this islet and extends about $\frac{1}{2}$ mile from its southeastern and northwestern extremities. A 6-foot patch lying nearly $\frac{1}{2}$ mile southwestward of Lindholm is marked by buoys on its southern and western sides. A small ferry pier on the southwestern side of Lindholm serves a government veterinary experimental station which is located on the islet. There is a depth of 10 feet at the head of this pier and in a short dredged channel leading to it. The entrance of the channel is marked by two buoys. Range lights for the approach to the pier are shown when a vessel is expected.

Submarine cables are laid between Lindholm and the eastern side of Stege Bugt. The direction of these cables is indicated by range beacons at each landing place.

Nordre Løb, the passage between the flat extending from the northwestern end of Lindholm and the shorebank extending from the southwestern extremity of Ulvshale, has a least depth of 8 feet in the fairway and is marked on each side by spar buoys.

7C-11 Koster Rende, the main approach channel to Stege, is dredged to a depth of $13\frac{1}{2}$ feet. From a position in Ulvsund nearly $\frac{1}{2}$ mile eastward of Kalvehave Pynt this channel leads eastward for nearly 2 miles to a position about $\frac{3}{4}$ mile southward of Lindholm, passes between the flat extending from that islet and Gralen, and then leads northward and north-eastward of the latter flat toward the entrance of the harbor at Stege. The channel is marked by buoys in accordance with the Danish uniform system.

Currents in Stege Bugt are irregular and are governed by the wind. Easterly winds cause a southgoing current and westerly winds, a northgoing current.

Stege, situated about 4 miles eastward of Ulvsund Bridge, has a harbor comprising the outlet of Stege Nor, a shallow tidal lake, and three basins entered from this outlet. The water level in the harbor is raised about 3 feet by northerly and northeasterly gales and is lowered the same amount by southerly and southwesterly gales.

The passage connecting Stege Nor with Stege Bugt is divided into two parts by a drawbridge. Ydre Havn, the northwestern part, has depths of 3.0 to 4.3 m (9.8 to 14.1 ft.). On the northeastern side of Ydre Havn is Nordre Havn, a small basin with depths of 4.2 m (13.7 ft.), and immediately northward of this basin is a yacht basin. Sukkerfabrikshavn, a narrow basin on the southwestern side of Ydre Havn, serves a sugar factory. On the southeastern side of Sukkerfabrikshavn is a quay with a length of 570 feet and a depth alongside of 4.0 m (13.1 ft.). Two wharves on the northeastern side of Indre Havn, the southeastern part of the harbor, have a depth of 3.7 m (12.1 ft.) alongside; a short distance off these wharves the depths are 5.5 to 6.0 m (18.0 to 19.6 ft.). Along the southwestern side of Indre Havn is a row of dolphins.

There is a 3-ton coal crane on the quay in Sukkerfabrikshavn and a 5-ton crane on the northwestern wharf in Indre Havn. A grain elevator is located on the eastern side of Nordre Havn.

A light is shown on the southwestern side of Ydre Havn. A light is shown on each side of Nordre Havn.

There are no pilots at Stege. Pilots are available at Masnedø.

Stege, the principal town on Møn, had a population of 2,590 in 1965. Provisions, water, and coal can be obtained. Minor repairs can be made. A marine railway with a lifting power of 200 tons is located in Indre Havn. The nearest railroad station is at Kalvehave Havn.

Bøgestrøm.—This section of the northern passage is entered from southward about 2

miles north-northeastward of Kalvehave Pynt. After passing westward of Nyord it leads in a general northeasterly direction between the shorebank bordering the east coast of Sjælland and extensive flats northward of Nyord. The channel is narrow and winding with a least bottom width of about 165 feet, and it is dredged in several places to enable vessels to proceed between Ulysund and the Baltic Sea in a least depth of 8 feet at mean water level. The water level is raised by easterly winds that continue for a period of 3 or 4 days, but it is lowered by a long period of easterly gales. During westerly gales the water level is lowered on the first day, but thereafter it is raised. A tide gage on the southern side of the Baltic entrance of Bøgestrøm indicates the height of the water with reference to mean water level.

Nyord (*western extremity, 55°03' N., 12°11' E.*) lies close westward of Ulvshale. It is low except in its western part, where it rises to a height of 49 feet, and is without woods. A church surmounted by a spire stands in Nyord village, on the southern side of the island. Several islets lie on the flats northward of Nyord.

7C-12 Jungshoved, a broad, low peninsula projecting eastward on the east coast of Sjælland, is partly wooded on its eastern side. Its southeastern extremity lies about 2 miles north-northwestward of Nyord. Jungshoved Church, on the southwestern extremity of Jungshoved, is white and has a tower.

The southern entrance of Bøgestrøm is between Bredø and Stengrund. **Bredø**, a shoal with a least depth of 1 foot over a rock on its northeastern extremity, lies about $\frac{3}{4}$ mile southward of Nyord Church, and its western side is marked by a spar buoy. **Stengrund**, with a

least depth of 2.0 m (6.5 ft.), lies close northwestward of Bredø and about $\frac{1}{2}$ mile southwestward of Nyord Church; its south-eastward extremity and northeastern side are marked by spar buoys.

The northeastern entrance is a dredged channel with a least depth of 2.7 m (8.8 ft.). It leads between Stenhage, a portion of the Sjælland shorebank which extends about $2\frac{1}{4}$ miles eastward from Jungshoved, and Sandhage, the northern extremity of a large flat which extends up to $3\frac{3}{4}$ miles northward from Nyord. There is some silting in the entrance. A wreck with a depth of 2.4 m (7.8 ft.) lies close southward of the outer end of the channel.

The seaward approach to the northeastern entrance is marked by **Bøgestrøm Lighted Whistle Buoy**, which is moored in a depth of $4\frac{1}{4}$ fathoms about 1 mile off the entrance and $3\frac{1}{2}$ miles east-northeastward of the western extremity of Jungshoved; this buoy is replaced by a spar buoy when ice is expected. A red and white horizontally striped spar buoy is moored close off the entrance. Both sides of Bøgestrøm are marked by buoys.

Sandhage Light is shown at the northwestern extremity of Sandhage and about $1\frac{1}{2}$ miles eastward of the eastern extremity of Jungshoved. This light is surmounted by a radar reflector.

Stenhage Light is shown at the southeastern extremity of Stenhage and nearly $\frac{1}{2}$ mile south-southwestward of Sandhage Light.

A beacon with a rectangular topmark stands eastward of the fairway and about 2 miles south-westward of Stenhage Light.

Nyord Havn, fronting the western side of Nyord village, is formed by two breakwaters. There is a depth of 2.2 m (7.2 ft.) in the harbor and in a short approach channel. Westerly winds may lower the water level about 2 feet; northeasterly winds raise it. A light is shown occasionally on the western breakwater.

Sandvig Fishing Harbor, on the east coast of Sjølland and about $4\frac{1}{4}$ miles north-northwestward of Kalvehave Pynt, is a small basin with depths of 1.0 to 1.7 m (3.2 to 5.5 ft.). A pair of range lights are shown occasionally at this harbor.

Stavreby Boat Harbor, about $\frac{3}{4}$ mile eastward of Jungshoved Church, has a depth of 5 feet and is approached by a channel with the same depth. The channel is marked by spar buoys, but the buoyage is unreliable. A pair of range lights for the channel is shown occasionally.

Ulvshale Lob is the narrow winding channel between Nyord and Ulvshale. The southwestern entrance of Ulvshale Lob is dredged and the southwestern part of the channel is marked by spar buoys. The Baltic entrance of the channel can be used only by small craft drawing not over 5 feet. A bridge, with a vertical clearance of 11 $\frac{1}{2}$ feet, spans the channel; submarine cables are laid close southward.

SOUTHERN PASSAGE

7C-13 The southern passage, which follows the north coast of Falster and passes southward of Masnedø, Farø, Bogø, and Møn, is divided into three sections: Storstrøm, extending from Dyrefod Flak to Farø; Sortsø Gab, from Farø to the western end of Stubbekøbing; and Grønsund, from Stubbekøbing to the Baltic Sea.

Pilots.—The pilot stationed on Masnedø (sec. 7C-6) will take a vessel through the southern passage to Grønsund and Hestehoved Dyb.

A vessel approaching the Baltic entrance of the southern passage from seaward can obtain a pilot from Masnedø. When near the fairway buoy, the vessel should signal for a pilot and wait off the channel entrance for him to arrive from Hesnæs. If the pilot is ordered in advance, he will meet the vessel off the entrance at an arranged time.

See also section 7-6.

Storstrøm.—On the northern side of the western part of Storstrøm is **Masnedø Kalv**, a low islet lying about $\frac{1}{2}$ mile westward of the southern end of Masnedø. **Kalverev**, a rocky flat with depths of less than 3 fathoms, extends about 1 mile northwestward from Masnedø Kalv. A 5-foot patch on the southwestern side of Kalverev lies in a position about $\frac{3}{4}$ mile west-northwestward of Masnedø Kalv and is close to the edge of the fairway. The southwestern side of Kalverev is marked by a conical buoy moored in a depth of $4\frac{1}{4}$ fathoms about $\frac{1}{2}$ mile westward of Masnedø Kalv. A flat with depths of less than 3 fathoms extends nearly $\frac{1}{2}$ mile southeastward from Masnedø Kalv. Between Masnedø Kalv and Masnedø is a narrow and relatively deep channel which is buoyed as far as two small harbors located on the southwestern side of Masnedø. See section 7C-2 for change of buoyage westward of Masnedø Kalv.

Masnedø Benzinhavn, near the southern extremity of Masnedø, has depths of 4.5 m (14.7 ft.); Masnedø Jernhavn, close north-westward, has 3.0 to 5.0 m (9.8 to 16.4 ft.).

The northern side of Storstrøm between Masnedø and Farø is formed by the flat (sec. 7C-8) connecting those islands. The southern side of this flat is marked by a conical buoy moored about $1\frac{1}{2}$ miles westward of Farø.

The Falster coast adjacent to Storstrøm consists of two peninsulas separated by a very shallow bay. The western peninsula, on which are some low hills, terminates northwestward in Orehoved (sec. 7A-12). Orehoved Havn is situated about 1 mile east-southeastward of the northern extremity of Orehoved. Gyldenbjerg Church, which has a tall, black spire, stands

about 1 mile southward of Orehoved Havn and is a prominent landmark. Havnsø Naeb, about 2 3/4 miles east-southeastward of Orehoved Havn, is the northwestern extremity of the peninsula on the eastern side of the bay, and Farnaes Pynt, about 2 miles farther east-southeastward, is the northeastern extremity. The eastern peninsula is mainly low. Both peninsulas are wooded in places.

The shorebank bordering the northeastern side of Orehoved extends up to 2/3 mile from that point; on the inner part of this bank is a small islet, Vedby Hage, which has a least depth of 5 feet, lies close northward of Orehoved Havn, and its southeastern part is separated from the shorebank by a narrow blind channel with depths of less than 7.0 m (22.9 ft.). Havnsø Nakke, a steep-to flat with depths of less than 7 feet, extends about 1 mile northwestward and 1/2 mile northward from Havnsø Naeb. A can buoy is moored close off the edge of Havnsø Nakke northward of Havnsø Naeb. Eastward of Havnsø Nakke the shorebank gradually diminishes in width toward Farnaes Pynt.

There are several patches with depths of less than 3 fathoms in the southern half of the fairway of Storstrom; the shoalest of these, a 3.6 m (11.8 ft.) patch, lies about 1 1/2 miles northwestward of Havnsø Naeb and is marked on its northern side by a can buoy. Except for these patches the fairway has depths of 4 to 19 1/2 fathoms, the greatest depths being in the extreme eastern part. In the portion of the fairway lying northward of the shorebank between Orehoved Havn and Havnsø Naeb the depths are very irregular.

The tidal currents in Storstrom change direction regularly in settled weather and have a rate of 1 to 2 knots. In stormy weather they are irregular, and a current may set in one direction for a long period during which it may attain a rate of 3 to 5 knots. Westerly and northwesterly gales cause an eastgoing current, and easterly and southeasterly gales cause a westgoing current.

7C-14 OREHOVED LIGHT (54° 58' N., 11° 51' E.), a guide for approaching the western entrance of Storstrom from northward, is shown on the western side of the mole at Orehoved Havn.

Submarine cables cross Storstrom from the southern end of Masnedo to a position close east-southeastward of Orehoved Havn and are marked by two pairs of range beacons on Masnedo. Another cable is laid from the southern end of Masnedo to a position about 1/2 mile southeastward of Orehoved Havn and is marked by range beacons on Falster.

ANCHORAGE can be taken anywhere in the fairway southeastward of Masnedo. Small vessels can anchor on Masnedo Oster Flak (sec. 7C-6), where there is good holding ground and little sea.

FIRING PRACTICE takes place occasionally from a fort on Masnedo. During the time of such practice, International Code flag No. 7 by day and three red lights in a vertical line at night are conspicuously displayed. Firing will be suspended to permit passage of vessels through the fairway.

STORSTROM BRIDGE crosses Storstrom between the southern extremity of Masnedo and a position on Falster about 2/3 mile southeastward of Orehoved Havn. It is a fixed bridge resting on 51 piers. The twenty-second, twenty-third, and twenty-fourth spans from the northern end of the bridge have conspicuous arched superstructures. The vertical and horizontal clearances in the passage under the central arched span are respectively 85 feet and 364 feet. Each of the passages under the other arched spans has a vertical clearance of 83 feet and a horizontal clearance of 252 feet. The vertical clearance under the remaining spans decreases gradually toward both ends of the bridge. The vertical clearances given above are at mean water level.

The sides of the passages under the northern and central arched spans are marked by lights visible to vessels approaching from either direction. Lights are shown on both sides of the bridge over the middle of a passage on each side of the fairway. A fog signal is sounded from the pier between the northern and central arched spans.

A tide gage is located on the western end of the southern side of the passage under the central arched span.

The passage under the northern arched span is for the use of westbound vessels, and that under the central arched span is for the use of eastbound vessels. If necessary because of the height of their masts, westbound vessels may pass through the passage under the central span, but they must do so only when it is not being used by eastbound vessels.

Anchoring within 550 yards eastward and 1,970 yards westward of the bridge is prohibited except in an emergency, such as danger of collision.

OREHOVED HAVN consists of a mole about 200 yards wide, extending about 400 yards north-northeastward from the shore, about 2/3 mile northwestward of the bridge. A dredged channel, 164 feet wide and 7.0 m (22.9 ft.), marked by spar buoys, provides access to the mole from eastward. A light at the head of the mole, and in line with Orehoved Light (sec. 7C-14), bearing 272°, leads through the dredged channel. There is a turning basin northeastward of the mole. The quay, 600 feet long, on the eastern side of the mole, has depths alongside of 5.0 to 7.0 m (16.4 to 22.9 ft.). Easterly winds and those between northwest and north may raise the water level about 3 feet, and winds between south and southwest may lower it the same amount.

GAABENSE PIER, about 1 1/4 miles south-eastward of Orehoved Havn, is approached from northward by a dredged and buoyed channel. There is a depth of 8 1/2 feet in the channel and alongside the outer part of the pier. Gales between northwest and northeast may raise the water level about 3 feet, and those between southeast and southwest may lower it about 4 feet.

7C-15 SORTSO GAB.—From the eastern end of Storstrom abreast Faro the section of the southern passage named Sortso Gab leads

south-southeastward between Farnaes Pynt and the western side of Bogo and then turns eastward to the western limit of Gronsund, off the western end of the town of Stubbekobing.

The northwestern part of Sortso Gab is bounded on its northeastern side by the shorebank extending from Faro and the flat connecting that island with Bogo (sec. 7C-9); a 4-foot patch, its western side steep-to, lies on the edge of this flat in a position about 1/3 mile west-northwestward of the northwestern extremity of Bogo. The shorebank along the western side of Bogo is very narrow and steep-to. Bredemads Hage, a flat with depths of less than 6 feet, extends up to 1/2 mile from the southern side of Bogo. A spit having depths of less than 3 fathoms projects from the southwestern side of Bredemads Hage and is marked on its southwestern side by a conical buoy moored about 1 3/4 miles south-southeastward of the northwestern extremity of Bogo.

A shoal with a least depth of 16 feet lies from about 1 1/4 to 1 3/4 miles westward of the southeastern extremity of Bogo and is marked on its southern side by a conical buoy; the main fairway leads southward of this shoal.

The shorebank bordering the Falster coast is very narrow and steep-to at Farnaes Pynt, but it becomes wider immediately southward of this point, and about midway along the coast between Farnaes Pynt and Stubbekobing it has a width of about 1/2 mile. A sandy patch with a least depth of 11 feet lies on the southern side of the main fairway and about 1/3 mile north-northwestward of the harbor at Stubbekobing; it is separated from the shorebank southward by a channel with depths of over 6 fathoms.

The main fairway of Sortso Gab has depths of 6 to 20 3/4 fathoms, the greatest depths being in the central and northwestern parts. Small vessels can anchor on the Falster shorebank in depths of 2.4 to 3.0 m (7.8 to 9.8 ft.) off Sortso, a village located about 1 mile southward of Farnaes Pynt, but because of the considerable depths in the fairway and the steep-to shorebanks on

both sides, there are no good anchorages for larger vessels in Sortso Gab.

Bogo Light is shown on the northwestern extremity of Bogo.

Stubbekobing Light is shown on the western side of the town of Stubbekobing in a position about 3 miles southeastward of Farnaes Pynt.

GRONSUND.—For purposes of description, Gronsund, the southeastern section of the northern passage, is regarded as being divided into a western part and an eastern part by a line joining Skansepynt and Haarbolle Pynt.

The tidal currents in Gronsund change direction regularly in fine, settled weather. In stormy weather the direction and velocity of the current is governed by the wind. Westerly and northerly winds cause an eastgoing current, and easterly and southerly winds cause a westgoing current. In the narrow part of the fairway off Haarbolle Pynt the current may attain a rate of 3 to 4 knots.

The water level in the fairway is usually raised by northerly winds and lowered by southerly winds. Unsettled weather, especially in the spring, may cause the water level to fall as much as 2 feet below mean level.

7C-16 WESTERN PART OF GRONSUND.—From Stubbekobing Light the Falster coast trends in a general easterly direction for about 3 1/4 miles to Skansepynt, where it turns sharply southward. Prominent landmarks are Stubbekobing Church, which has a broad red tower; and the white main building of Naesgaard, an estate situated about 1 mile southward of Skansepynt.

On the northern side of the western part of Gronsund is the eastern part of Bogo; the causeway (sec. 7C-9) connecting Bogo with Mon; and Borgsted, a low peninsula which forms the southwestern extremity of Mon. Immediately southward of the eastern part of Borgsted is the entrance of Faneffjord, a

small and very shallow inlet. Haarbolle Pynt, about 1 1/3 miles south-southeastward of the entrance of Faneffjord, is low. Faneffjord Church, which is white with a red roof, stands at the head of Faneffjord.

The shorebank on the Falster side varies in width from 200 yards to 1/3 mile except near Skansepynt, where it almost disappears. On the northern side of the fairway the shorebank extending from Bogo narrows eastward of Bredemads Hage, and off the southeastern extremity of Bogo it is about 200 yards wide. The shallow flat (sec. 7C-9) connecting Bogo with Mon extends up to nearly 1/3 mile southward from the causeway that crosses it. The shorebank extends up to 1/3 mile from the southern side of Borgsted, and thence southeastward it decreases in width to Haarbolle Pynt, where it is very narrow.

There are depths of 6 to 11 fathoms in the middle of the fairway. The shorebanks on both sides are steep-to. A wreck with a depth of 5 1/2 fathoms lies about 2/3 mile west-northwestward of Skansepynt.

The best anchorage in the western part of Gronsund is off Stubbekobing, where vessels can anchor according to their draft.

A submarine cable is laid across the sound from a position close west-northwestward of the southeastern extremity of Bogo to a position about 3/4 mile eastward of Stubbekobing Church; its direction is indicated by a pair of range beacons on Bogo. A submarine cable extends from a point on Bogo, about 1/4 mile southward of Bogo Light, westward to the opposite shore. There is another submarine cable laid southward of Skansepynt to Mon.

Firing practice takes place occasionally from a battery on Borgsted. During the time of such practice, International Code flag No. 7 by day and three red lights in a vertical line at night are conspicuously displayed. Firing will be suspended to permit passage of vessels through the fairway.

Borgsted Light is shown on the western part of Borgsted.

Haarbolle Pynt North Range Lights are located northward of Haarbolle Pynt. The front light is shown in a position nearly 1 mile southwestward of Fanefford Church, and the rear light is shown in a position nearly 1/2 mile east-southeastward of the front light. These lights in range 102 1/2° lead through the fairway of the western part of Gronsund.

STUBBEKOBING (54° 53' N., 12° 03' E.) has a harbor comprising a rectangular basin and, immediately westward of the basin, a dredged area which fronts a quay and which is protected by a detached breakwater. The harbor is approached from northward by a dredged and buoyed channel that bifurcates about 100 yards northward of the basin entrance, one branch leading into the basin and the other leading to the western dredged area. There is a depth of 18 feet in the approach channels, in the central part of the basin, and in the dredged area westward of the basin. In the northwestern part of the basin the depths are 3.1 to 3.4 m (10.1 to 11.1 ft.) and in the eastern part the depths are 1.2 to 2.5 m (3.9 to 8.2 ft.). Winds between north and northeast may raise the water level about 4 feet, and southerly and southwesterly gales may lower it the same amount.

A light is shown on the western side of the entrance of the basin and another light is shown close southward of the basin. These lights in range 176° lead through the entrance of the approach channel; they are not shown when the harbor is closed by ice.

The harbormaster acts as pilot for vessels entering or leaving the harbor.

A quay on the southern side of the basin has a length of about 440 feet and a depth alongside of 18 feet. The quay westward of the basin has a length of about 310 feet and a depth alongside of 18 feet. No cranes are available.

Provisions, water, and a small amount of coal can be obtained. A machine shop and an iron foundry are located in the town. Ferry service is maintained between Stubbekobing and Bogo.

7C-17 Bogo Havn (Lindebro) is situated on the south coast of Bogo opposite Stubbekobing. It consists of a small basin on the eastern side of a mole which projects south-southwestward from the shore. A detached breakwater protects the western side of the mole, where there is a ferry slip with depths of 3.1 m (10.1 ft.). The basin has depths of 2.5 to 3.0 m (8.2 to 9.8 ft.). The harbor is approached by a dredged channel with a depth of 3.1 m (10.1 ft.). Northeasterly winds may raise the water level about 3 feet, and southwesterly winds may lower it about the same amount. During southwesterly gales an accumulation of weed may reduce the depth in the dredged channel.

A light is shown from a post on each side of the entrance to the dredged channel; a fog signal is sounded from the western light. Range lights for the channel are shown occasionally at the harbor. The sides of the channel are marked by spar buoys, and a fairway buoy is moored close off the entrance.

Haarbolle Fishing Harbor is located nearly 3/4 mile north-northwestward of Haarbolle Pynt. There are depths of 2.5 to 3.0 m (8.2 to 9.8 ft.) in the harbor and 3.0 m (9.8 ft.) and in the dredged channel leading to it.

Haarbolle Hestehave Pier, on the western side of Haarbolle Pynt, has a depth of about 13 feet at its head.

EASTERN PART OF GRONSUND.—From Skansepynt the portion of the Falster coast that forms the western side of the eastern part of Gronsund trends south-southeastward for about 3 1/2 miles to Hestehoved (sec. 6A-7), the eastern extremity of Falster. The southern part of this stretch is wooded and has some steep bluffs along the shore. The northern side of the eastern part of Gronsund is formed by the Mon coast between Haarbolle Pynt and Madses Klint (sec. 6A-7), about 2 1/4 miles eastward. The coast southwestward of Hestehoved and that north-eastward of Madses Klint are described in chapter 6.

Stenpladerne, a group of rocky patches with a least depth of 2.0 m (6.5 ft.), lies on the western side of the fairway and nearly 1/3 mile westward of Haarbølle Pynt. The eastern side of the shoalest patch is marked by a can buoy.

Tolken, a large bank of fine sand that is continually shifting, occupies much of the eastern part of Grønsund. The depths in many places on this bank are less than 10 feet. Ny Tolk, the northeastern part of Tolken, and Flæskegrund, west-northwestward of Ny Tolk, are separated from Gammel Tolk, the southwestern part of the bank, by Tolke Dyb. Most of Tolke Dyb is quite deep, but its seaward end is obstructed by a bar which is subject to shoaling.

Hestehoved Dyb and Nyt Løb, its continuation northward, separate Gammel Tolk from the Falster shorebank, and leading through these passages is a dredged channel, with a normal depth of 5.0 m (16.4 ft.) and a width of 262 feet, which affords access to Grønsund from the Baltic Sea.

The northern end of the dredged channel, nearly 1 mile south-southeastward of Haarbølle Pynt, is marked by a conical **buoy** on the eastern side and a can **buoy** on the western side. The junction of the dredged channel in Nyt Løb with that in Hestehoved Dyb, about midway between Haarbølle Pynt and Hestehoved, is marked by a conical **buoy** on the eastern side and a **light buoy** on the western side. The seaward end of the dredged channel, about 1/2 mile eastward of Hestehoved, is marked by a **light buoy** on the eastern side and a can **buoy** on the western side. The channel is also marked on both sides by spar **buoys**. Most of the buoys marking the dredged channel have reflectors.

Hestehoved SE. Lighted Whistle Buoy is moored on the range leading through Heste-

hoved Dyb and about 1 1/2 miles southeastward of Hestehoved. It is the fairway buoy for the eastern entrance of Grønsund.

Grønsund Range Lights are shown near Skansepynt and in range 324° lead through the dredged channel in Hestehoved Dyb.

Haarbølle Pynt South Range Lights lead through Nyt Løb. The front light is shown close east-northeastward of Haarbølle Pynt, and the rear light is shown from the same structure as the rear light of Haarbølle Pynt North Range Lights. These lights in range bear 353°.

7C-18 Directions for the southern passage.—*By day:* A vessel approaching Storstrøm from northwestward should keep the middle of the second span from the southern end of Storstrøm Bridge in range about 150° with the head of Gaabense Pier; Gundslev Church, about 2 1/2 miles southward of Havnsø Næb, is also on this range. The vessel should continue on the range until the buoy marking the southwestern side of Kalverev is almost abeam, when course should be steered toward the passage under the central arched span of Storstrøm Bridge. After passing under the bridge the vessel should keep Bogø Church bearing about 110° and just open southward of the southern extremity of Farø, taking care to avoid the 3.6 m (11.8 ft.) patch lying about 1 1/2 miles northwestward of Havnsø Næb. When Stubbekøbing Church comes in range about 143° with the southwestern extremity of Bogo, the vessel should turn into Sortsø Gab on this range.

Having entered Sortsø Gab, Stubbekøbing Church should gradually be opened westward of Bogø, the southwestern extremity of which can be passed at a distance of about 100 yards. The vessel should pass close southwestward of the buoy marking the spit on the southwestern side of Bredemads Hage and close southward of the buoy marking the shoal lying from 1 1/4 to 1 3/4 miles westward of the southeastern ex-

tremity of Bogø. If bound for Stubbekøbing, the vessel should take care to pass clear northward and eastward of the 3.4 m (11.1 ft.) patch lying about 1/3 mile north-northwestward of the harbor. If continuing through Grønsund, the vessel should keep Fanefjord Church bearing about 091° until Haarbolle Pynt is just open northeastward of Skansepynt and should then turn east-southeastward and southeastward into the eastern part of the sound, taking care to avoid Stenpladerne. Skansepynt and Haarbolle Pynt can be passed fairly close.

The directions for the eastern part of Grønsund are given for vessels entering from the Baltic Sea. A vessel approaching from southward should take care to pass eastward of the buoy marking the 2.2 m (7.2 ft.) patch lying nearly 1 1/2 miles off Hesnaes (sec. 6A-7), and a vessel from eastward should proceed to Hestehoved SE. Lighted Whistle Buoy before turning toward the entrance of the dredged channel. Grønsund Range Lights, in range 324°, lead through the dredged channel in Hestehoved Dyb; the rear light structure, a lattice mast, is difficult to identify from the seaward end of the channel. Hestehoved Dyb and Nyt Lob dredged channels are navigated with the aid of the buoys and ranges.

From the northern end of the dredged channel a course should be steered for Haarbolle Pynt, and when near the point, a northwesterly course should be steered to pass between it and Stenpladerne. Bogø Mill, located about 1/3 mile northward of Bogø Havn, leads northeastward of Stenpladerne when bearing about 307° and open northeastward of Skansepynt.

At night: The white sector of Orehoved Light leads from northward into the western entrance of Storstrøm in depths of not less than

18 feet, and the white sector of Bogø Light leads through the main navigable passages under Storstrøm Bridge and the fairway of Storstrøm to the northwestern end of Sortsø Gab.

A vessel should proceed through Sortsø Gab in the white sector of Stubbekøbing Light to a position about 1 mile north-northwestward of that light, and thence she should pass through the western part of Grønsund with Haarbolle Pynt North Range Lights in range 102 1/2°. When the vessel enters the red sector of Borgsted Light, she should turn gradually southeastward into the white sector of the light, which leads between Stenpladerne and Haarbolle Pynt.

Grønsund should be approached from the Baltic Sea by keeping in the white sector of the light (sec. 6A-7) on Hestehoved. As the southeastern extremity of Tolken lies about 1 mile eastward of Hestehoved and is within the white sector of the light, a vessel from eastward should pass near Hestehoved SE. Lighted Whistle Buoy before approaching Hestehoved Dyb.

Having arrived at the entrance of the dredged channel, the vessel should proceed through with the guidance of the range lights and light buoys. After clearing the northern end of the dredged channel, the vessel should continue on Haarbolle Pynt South Range until she is in the white sector of Borgsted Light.

ANCHORAGES

7C-19 Storstrøm.—See section 7C-14.

Masnedo Oster Flak.—See section 7C-14.

Sortsø Gab.—See section 7C-15.

Grønsund.—See section 7C-16.

APPENDIX

CLIMATOLOGICAL TABLES

Prepared by the U. S. Weather Bureau

ODENSE.—Lat. 55°23' N., long. 10°27' E., elevation 49 feet

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of record
SEA LEVEL PRESSURE														
Average (millibars).....	1,015	1,014	1,012	1,013	1,015	1,014	1,013	1,012	1,015	1,014	1,014	1,012	1,014	50
TEMPERATURE														
Average (° F.).....	33	32	36	44	53	59	62	60	55	47	40	35	46	40
Average daily maximum (° F.).....	37	37	43	52	61	66	71	68	62	53	44	39	53	20
Average daily minimum (° F.).....	29	28	32	36	43	48	53	52	47	41	35	32	40	20
Extreme highest each month (° F.).....	51	54	69	82	89	90	93	91	87	76	62	54	93	44
Extreme lowest each month (° F.).....	-2	-9	2	19	27	33	38	36	31	20	6	-1	-9	44
Mean number of days with frost.....	17	19	17	7	1	0	0	0	0.1	4	9	15	89	32
RELATIVE HUMIDITY														
Average percent (0800).....	91	90	89	84	78	78	81	86	90	91	92	92	87	27
Average percent (1400).....	88	83	77	67	61	64	65	68	72	78	86	89	75	27
CLOUD COVER														
Average amount (tenths).....	7.9	7.6	6.7	6.1	5.6	5.8	6.0	6.1	5.7	6.8	7.5	8.1	6.7	30
Less than 1/10 average amount (mean number of days).....	0.9	1	3	3	3	3	2	2	2	2	0.8	0.8	24	23
More than 1/10 average amount (mean number of days).....	18	14	13	8	6	6	8	7	6	12	14	19	131	23
PRECIPITATION														
Average amount (inches).....	1.78	1.46	1.64	1.60	1.62	1.84	2.42	2.84	2.19	2.59	2.04	2.12	24.14	54
Greatest amount (inches).....	3.62	3.98	4.41	3.62	3.98	5.47	4.96	5.67	5.71	6.54	5.31	5.04	33.15	66
Least amount (inches).....	0.16	0.00	0.20	0.04	0.12	0.28	0.47	0.87	0.67	0.28	0.16	0.35	18.15	66
Maximum in 24 hours (inches).....	0.77	0.91	0.66	0.99	1.36	1.10	2.75	1.53	2.40	0.98	1.36	0.81	2.75	27
0.01 inch or more (mean number of days).....	17	14	16	15	13	12	14	16	15	18	17	18	183	54
WIND														
Mean wind speed (knots).....	7.2	7.1	5.4	6.1	5.0	4.8	4.8	4.6	4.2	4.8	4.8	5.9	5.4	16
44 knots or over (mean number of days).....	0.2	0.2	0.2	0	0	0.1	0	0	0	0.2	0.3	0.2	1	25
VISIBILITY														
Days with fog.....	7.2	5.2	4.4	2.0	0.4	0.1	0.2	0.6	2.5	5.1	5.5	6.4	39.6	54

FREDERICIA.—Lat. 55°33' N., long. 9°44' E., elevation 26 feet

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of record
SEA LEVEL PRESSURE														
Average (millibars).....	1,014	1,016	1,012	1,014	1,014	1,014	1,012	1,012	1,015	1,011	1,014	1,013	1,013	15
TEMPERATURE														
Average (° F.).....	32	33	35	43	51	58	61	60	55	47	40	35	46	40
Average daily maximum (° F.).....	35	36	40	49	59	66	69	67	61	52	43	38	51	40
Average daily minimum (° F.).....	29	29	31	37	44	51	55	54	49	43	36	31	41	40
Extreme highest each month (° F.).....	49	50	61	68	85	85	87	83	82	67	58	52	87	40
Extreme lowest each month (° F.).....	-2	-3	4	23	28	37	44	40	33	25	11	8	-3	40
CLOUD COVER														
Average amount (tenths).....	7	7	7	6	5	5	6	6	6	7	7	8	6	—
PRECIPITATION														
Average amount (inches).....	1.46	1.30	1.54	1.30	1.57	1.97	2.48	3.27	2.13	2.72	1.97	1.97	23.66	40
Maximum in 24 hours (inches).....	0.87	0.98	0.91	0.83	1.10	1.73	1.77	1.34	1.46	1.18	1.02	0.83	1.77	40
Mean number of days with more than 0.004 inch.....	15	13	14	13	14	11	14	17	16	18	15	16	176	40
VISIBILITY														
Days with fog.....	4	3	2	2	0.6	0.3	0.4	0.5	1	2	2	3	21	40

SVENDBORG.—Lat. 55°03' N., long. 10°39' E., elevation 23 feet

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of record
TEMPERATURE														
Average (° F.).....	32	32	36	43	52	59	62	60	55	48	40	35	46	40
Average daily maximum (° F.).....	35	36	40	48	58	67	69	69	62	52	44	37	51	40
Average daily minimum (° F.).....	28	28	31	36	44	51	55	54	50	43	36	31	41	40
Extreme highest each month (° F.).....	49	52	61	68	83	88	88	85	81	68	58	52	88	40
Extreme lowest each month (° F.).....	0	2	4	22	27	37	42	41	32	25	13	4	0	40
Mean number of days with frost.....	20.7	20.4	17.3	5.3	0.1	0	0	0	0	1.2	7.6	15.4	88	40
RELATIVE HUMIDITY														
Average percent.....	88	85	78	69	63	63	66	68	75	80	87	89	76	40
CLOUD COVER														
Average amount (tenths).....	6.8	6.5	5.7	4.7	4.1	4.0	4.3	4.4	4.3	5.8	6.4	7.1	5.3	40
PRECIPITATION														
Average amount (inches).....	1.39	1.12	1.36	1.21	1.27	1.42	1.77	2.19	1.60	1.89	1.54	1.74	18.52	40
Maximum in 24 hours (inches).....	0.79	1.30	0.87	0.83	1.14	1.65	1.93	2.36	2.09	1.69	0.79	0.94	2.36	40
Mean number of days with more than 0.004 inch.....	13	12	14	10	11	9	12	14	13	16	14	15	153	40
WIND														
Direction (percentage of all observations): ¹														
North.....	6	7	7	7	7	8	7	6	7	7	7	6	7	40
Northeast.....	9	8	10	11	12	7	4	4	7	8	7	8	8	40
East.....	9	11	14	20	17	14	7	7	12	14	9	8	12	40
Southeast.....	12	12	12	12	11	10	9	10	11	12	12	12	11	40
South.....	10	9	9	6	5	5	6	7	7	10	12	12	8	40
Southwest.....	21	21	16	13	12	11	15	17	17	21	23	24	18	40
West.....	21	19	19	16	18	20	26	20	15	17	19	20	20	40
Northwest.....	10	11	11	12	14	20	21	19	15	10	10	9	13	40
Calm.....	2	2	2	3	4	5	5	4	3	3	3	2	3	40
Mean Beaufort force.....	4.0	3.8	3.8	3.3	3.1	3.0	3.1	3.3	3.4	3.9	3.9	4.1	3.6	40
Mean number of days with gales ¹	2	1	2	0.5	0.4	0.5	0.4	0.6	0.8	2	2	3	15	40
VISIBILITY														
Days with fog ¹	14	11	11	6	4	2	2	2	4	7	9	11	83	40

¹ Keldsnor lighthouse.

MARSTAL.—Lat. 54°51' N., long. 10°32' E., elevation 39 feet

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of record
SEA LEVEL PRESSURE														
Average (millibars).....	1,016	1,014	1,012	1,013	1,015	1,015	1,013	1,013	1,015	1,014	1,014	1,012	1,014	50
TEMPERATURE														
Average (° F.).....	33	33	36	43	52	59	62	61	56	48	41	36	47	40
Average daily minimum (° F.).....	31	30	33	38	46	52	56	55	51	45	37	33	42	30
Extreme lowest each month (° F.).....	15	4	9	22	31	39	45	43	39	27	19	13	4	30
Mean number of days with frost.....	19.1	19.1	13.5	2.7	0.0	0.0	0.0	0.0	0.0	0.4	5.0	12.5	72	40
CLOUD COVER														
Average amount (tenths).....	7.8	7.3	6.9	6.1	5.2	5.7	5.8	6.3	5.8	6.9	7.4	8.0	6.6	30
Average amount (tenths) 0800.....	7.9	7.6	7.1	6.3	5.5	6.0	6.1	6.5	6.0	7.0	7.6	8.0	6.8	30
Average amount (tenths) 1400.....	7.6	7.0	6.6	5.8	4.9	5.3	5.5	6.0	5.6	6.8	7.2	8.0	6.4	30
PRECIPITATION														
Average amount (inches).....	1.65	1.34	1.58	1.54	1.69	1.85	2.40	2.95	1.97	2.36	1.89	2.09	23.27	40
Greatest amount (inches).....	3.58	3.47	4.13	3.94	4.06	4.06	4.06	6.14	4.61	6.14	4.29	6.18	30.59	46
Least amount (inches).....	0.12	0.04	0.28	0.00	0.24	0.28	0.89	0.47	0.47	0.28	0.20	0.24	17.28	46
Maximum in 24 hours (inches).....	0.8	0.9	0.8	1.0	1.3	1.3	1.8	1.5	1.2	1.2	1.5	0.8	1.8	30
0.004 inch or more (mean number of days).....	14	11	13	13	12	12	13	15	12	14	15	15	159	30
Mean number of rainy days.....	13	10	12	12	12	12	13	16	13	15	13	15	156	35
WIND														
Direction (percentage of 0800 observations): ¹														
North.....	6	7	5	6	4	6	5	4	5	6	6	7	5	30
Northeast.....	7	6	10	12	13	7	6	3	8	7	7	7	8	30
East.....	7	10	14	15	15	10	8	6	11	10	8	6	10	30
Southeast.....	16	16	16	12	12	10	10	9	13	15	14	16	13	30
South.....	12	13	11	7	9	6	7	9	8	13	13	14	10	30
Southwest.....	22	20	17	14	12	12	15	18	16	20	23	23	18	30
West.....	17	16	15	16	16	21	23	26	18	14	15	15	18	30
Northwest.....	11	10	10	14	14	24	22	22	16	11	13	10	15	30
Calm.....	2	2	2	4	5	4	4	3	5	4	1	2	3	30
Mean Beaufort force (0800).....	4.0	3.5	3.5	3.2	2.8	3.1	3.0	3.3	3.3	3.7	4.0	4.0	3.5	30
Direction (percentage of 1400 observations): ¹														
North.....	5	5	5	6	4	5	3	3	4	6	5	6	5	30
Northeast.....	7	7	9	11	10	7	5	2	8	9	7	7	7	30
East.....	7	10	16	16	16	9	8	5	11	11	9	8	11	30
Southeast.....	15	18	16	14	15	12	12	12	13	16	14	15	14	30
South.....	10	10	9	7	7	6	6	8	8	12	11	12	9	30
Southwest.....	21	17	14	13	11	11	14	17	13	17	20	22	16	30
West.....	21	19	19	17	18	25	26	28	22	16	18	17	20	30
Northwest.....	12	10	9	13	12	19	20	20	15	10	13	10	14	30
Calm.....	2	4	3	3	7	6	6	5	6	3	3	3	4	30
Mean Beaufort force (1400).....	3.8	3.4	3.4	3.2	2.8	3.0	2.9	3.3	3.3	3.7	3.9	3.8	3.4	30
44 knots or over (mean number of days) ¹	2	2	1	0.5	0.3	0.6	0.2	0.7	1	2	3	3	16	30
VISIBILITY														
Days with visibility less than 1 mile.....	5	5	5	2	1	0.2	0	0.1	1	2	3	5	29	30
Days with fog.....	6	5	5	3	0.8	0.3	0.1	0.2	1	3	3	5	32	40

¹ Keldamor Lighthouse.

BOGØ.—Lat. 54°55' N., long 12°03' E., elevation 89 feet

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of record
SEA LEVEL PRESSURE														
Average (millibars).....	1,016	1,014	1,012	1,013	1,015	1,014	1,013	1,013	1,015	1,014	1,014	1,012	1,014	50
TEMPERATURE														
Average (°F.).....	32	32	36	42	51	58	62	61	55	48	40	35	46	40
Average daily maximum (°F.).....	35	36	40	49	59	66	69	68	61	52	43	38	51	40
Average daily minimum (°F.).....	28	28	31	37	44	52	56	55	50	43	36	31	41	40
Extreme highest each month (°F.).....	50	53	64	71	86	86	88	85	84	70	59	52	88	51
Extreme lowest each month (°F.).....	-9	-1	5	23	31	39	43	41	35	24	16	10	-9	53
Mean number of days with frost.....	21.1	21.3	16.7	4.1	0.0	0.0	0.0	0.0	0.0	0.8	7.0	15.3	86	40
RELATIVE HUMIDITY														
Average percent (0800).....	87	87	86	81	76	77	80	83	86	88	88	87	84	30
Average percent (1400).....	86	83	80	71	65	68	71	72	74	80	83	86	77	30
CLOUD COVER														
Average amount (tenths).....	7.7	7.5	7.2	6.3	5.8	5.5	6.0	6.1	5.5	7.1	7.7	8.3	6.7	40
Mean amount (tenths) 0800.....	8.1	7.8	7.6	7.0	6.3	6.3	6.5	7.0	6.4	7.4	7.7	8.4	7.2	30
Mean amount (tenths) 1400.....	7.9	7.8	7.6	6.7	5.9	5.9	6.2	6.7	6.4	7.5	7.8	8.4	7.1	30
PRECIPITATION														
Average amount (inches).....	1.58	1.30	1.50	1.42	1.61	1.85	2.80	2.64	1.85	2.24	1.77	1.97	22.56	40
Greatest amount (inches).....	3.54	4.92	3.47	3.27	3.90	4.53	6.58	5.24	4.09	5.75	4.02	4.53	28.03	53
Least amount (inches).....	0.20	0.04	0.16	0.04	0.24	0.24	0.55	0.55	0.43	0.47	0.12	0.32	16.02	53
Maximum in 24 hours (inches).....	0.6	2.0	1.4	0.8	1.0	1.2	4.7	2.4	0.8	1.5	1.2	1.0	4.7	30
0.04 inch or more (mean number of days).....	11	8	9	9	8	8	9	11	9	10	11	12	115	30
Mean number of rainy days.....	17	13	16	14	12	12	15	17	15	18	16	17	181	40
WIND														
Direction (percentage of 0800 observations):														
North.....	4	5	3	4	2	2	1	3	4	4	5	5	4	30
Northeast.....	7	8	11	16	16	10	8	5	10	9	7	8	10	30
East.....	10	14	18	17	17	11	11	6	11	11	9	9	12	30
Southeast.....	14	14	15	10	11	9	9	11	11	14	14	15	12	30
South.....	10	9	9	6	6	5	4	8	8	12	10	13	8	30
Southwest.....	22	19	16	15	12	15	17	21	21	23	26	23	19	30
West.....	20	18	17	18	20	27	28	27	17	12	15	15	20	30
Northwest.....	10	9	8	11	11	16	16	15	12	9	10	9	11	30
Calm.....	3	4	3	3	5	5	6	4	6	6	4	3	4	30
Mean Beaufort force (0800).....	3.2	2.8	2.9	3.1	2.8	2.9	2.7	2.9	2.8	2.7	2.8	3.0	2.9	30
Direction (percentage of 1400 observations):														
North.....	5	3	2	3	2	2	1	2	3	4	5	6	3	30
Northeast.....	7	9	12	16	13	7	7	4	10	9	7	8	9	30
East.....	11	15	19	19	21	15	13	9	14	13	9	9	14	30
Southeast.....	13	13	12	10	13	10	9	10	11	14	13	14	12	30
South.....	10	8	7	5	3	5	4	6	7	10	10	12	7	30
Southwest.....	22	20	17	14	12	14	16	19	18	21	25	23	18	30
West.....	21	18	20	21	24	32	34	33	22	16	18	17	23	30
Northwest.....	10	11	10	11	11	14	14	16	13	10	10	9	12	30
Calm.....	1	3	1	1	1	1	2	1	2	3	3	2	2	30
Mean Beaufort force (1400).....	3.4	3.0	3.3	3.5	3.2	3.2	3.0	3.3	3.3	3.0	3.1	3.2	3.2	30
44 knots or over (mean number of days).....	0.5	0.2	0.3	0.2	0.2	0.1	0	0.1	0.2	0.3	0.4	0.5	3	30
VISIBILITY														
Days with visibility less than 1 mile.....	5	5	5	2	1	1	0.1	0.2	2	3	4	5	33	30

FLENSBURG.—*Lat. 54°42' N., long. 9°22' E., elevation 33 feet*

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of record
SEA LEVEL PRESSURE														
Average (millibars).....	1,014	1,013	1,011	1,012	1,014	1,014	1,012	1,012	1,014	1,012	1,013	1,011	1,013	50
TEMPERATURE														
Average (° F.).....	33	33	37	43	52	58	62	60	55	47	40	35	46	50
Average daily maximum (° F.).....	37	38	43	51	61	67	70	68	64	54	44	39	53	50
Average daily minimum (° F.).....	29	29	32	36	44	49	53	52	48	42	35	31	40	50
Extreme highest each month (° F.).....	51	57	67	80	87	91	91	92	86	76	61	53	92	50
Extreme lowest each month (° F.).....	-7	-10	4	22	28	34	38	36	31	18	10	-2	-10	50
RELATIVE HUMIDITY														
Average percent (0700).....	91	89	89	85	78	78	82	87	91	91	91	91	87	20
Average percent (1400).....	87	83	76	65	60	61	65	67	70	77	84	88	74	50
CLOUD COVER														
Average amount (tenths).....	7.5	7.3	6.9	6.1	5.6	5.9	6.1	6.3	5.9	6.9	7.4	8.0	6.7	39
Less than 1/10 average amount (mean number of days).....	2.1	2.3	2.8	4.2	5.3	4.2	3.1	2.0	3.9	2.0	1.6	1.3	34.8	39
More than 9/10 average amount (mean number of days).....	17.0	14.4	13.5	10.1	8.0	8.9	9.3	8.7	8.3	13.0	15.0	19.0	145.2	39
PRECIPITATION														
Average amount (inches).....	2.01	1.73	1.93	1.61	1.97	2.60	2.91	3.62	3.07	2.95	2.56	2.56	29.52	90
Greatest amount (inches).....	5.00	4.41	5.16	4.53	4.29	4.17	9.37	7.80	9.21	6.97	6.02	6.02	39.33	40
Least amount (inches).....	0.75	0.20	0.35	0.12	0.47	0.83	0.71	0.91	0.43	0.28	0.67	0.71	22.32	40
Maximum in 24 hours (inches).....	1.0	1.1	0.9	1.0	1.3	3.6	3.5	3.3	1.5	1.1	1.0	1.2	3.6	34
0.01 inch or more (mean number of days).....	17	14	15	14	13	13	15	18	15	17	17	18	186	40
WIND														
Direction (percentage of 0700 observations):														
North.....	7	9	9	13	15	4	8	11	6	7	5	2	8	4
Northeast.....	1	4	5	12	14	6	4	5	3	7	5	7	6	4
East.....	11	13	29	21	20	15	4	14	8	3	10	13	14	4
Southeast.....	17	8	8	6	6	10	6	3	13	6	13	13	9	4
South.....	19	8	11	12	8	16	14	13	20	18	20	24	15	4
Southwest.....	20	20	13	8	9	14	11	13	23	26	16	21	16	4
West.....	17	24	11	11	11	20	26	21	14	18	13	10	16	4
Northwest.....	7	13	7	14	12	11	22	14	7	11	10	6	11	4
Calm.....	0.8	0.9	7	3	5	4	5	6	6	4	8	4	5	4
Mean Beaufort force (0700).....	3.6	3.6	2.9	2.9	2.9	2.7	2.6	2.4	2.8	3.2	2.8	3.1	3.0	4
Direction (percentage of 1400 observations):														
North.....	5	7	6	9	6	5	4	4	7	4	4	0.8	5	4
Northeast.....	4	7	6	8	7	4	6	7	4	10	5	4	6	4
East.....	13	12	33	26	34	18	10	17	12	5	13	19	18	4
Southeast.....	14	9	9	8	11	7	8	4	12	8	17	17	10	4
South.....	16	4	9	7	4	7	4	7	15	10	17	25	10	4
Southwest.....	19	20	14	12	6	19	14	15	20	25	13	14	16	4
West.....	19	22	12	15	20	29	34	27	20	19	17	11	21	4
Northwest.....	9	17	9	15	12	10	20	19	11	15	9	6	13	4
Calm.....	0.8	2	2	0	0	0.8	0	0	2	0.8	5	3	1	4
Mean Beaufort force (1400).....	3.7	3.9	3.7	3.7	3.7	3.7	3.7	3.7	3.9	4.0	3.2	3.2	3.7	4
Mean number of days with gales.....	3	3	4	1.1	1.2	1.0	0.8	0.8	2	2	3	3	25	16
VISIBILITY														
Days with fog.....	9	7	5	3	0.9	0.3	0.6	1.4	3	7	9	9	54	34

KIEL.—Lat. 54°20' N., long. 10°17' E., elevation 154 feet

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Year of record
SEA LEVEL PRESSURE														
Average (millibars).....	1,016	1,015	1,013	1,013	1,015	1,015	1,013	1,013	1,016	1,014	1,015	1,013	1,014	50
Extreme lowest.....	963	958	971	976	978	984	982	983	976	969	963	962	958	45
TEMPERATURE														
Average (°F.).....	32	32	36	43	51	58	61	60	55	47	38	34	46	80
Average daily maximum (°F.).....	35	37	42	50	59	65	69	67	62	52	43	38	52	50
Average daily minimum (°F.).....	29	29	32	37	45	51	55	54	50	43	36	32	41	50
Extreme highest each month (°F.).....	53	56	68	77	84	86	88	87	87	70	61	53	88	50
Extreme lowest each month (°F.).....	-1	-4	5	24	29	33	41	40	35	26	14	9	-4	50
Minimum 32° or less (mean number of days).....	19.0	17.2	14.0	4.3	0.1	0.0	0.0	0.0	0.0	0.9	7.5	14.5	77.5	50
RELATIVE HUMIDITY														
Average percent (0800).....	91	91	89	86	81	81	85	89	91	92	92	92	88	20
Average percent (1400).....	88	84	79	71	67	68	70	72	75	81	86	89	78	50
CLOUD COVER														
Average amount (tenths).....	7.5	7.3	6.9	6.1	5.5	5.8	6.1	6.3	5.8	6.8	7.4	8.0	6.6	50
Less than $\frac{1}{10}$ average amount (mean number of days).....	2.5	2.8	3.1	4.5	6.0	4.5	3.3	2.7	4.8	2.9	2.4	1.6	41.1	50
More than $\frac{1}{10}$ average amount (mean number of days).....	17.5	15.1	14.1	10.5	8.5	8.4	9.4	10.1	8.8	13.5	15.9	18.7	150.5	50
PRECIPITATION														
Average amount (inches).....	2.01	1.57	1.77	1.65	1.81	2.32	2.83	3.07	2.60	2.64	2.24	2.36	26.87	80
Greatest amount (inches).....	4.88	4.17	5.16	4.65	4.37	5.39	7.64	7.60	6.89	5.98	6.97	5.63	35.06	80
Least amount (inches).....	0.20	0.04	0.12	0.12	0.20	0.28	0.55	0.51	0.12	0.28	0.39	0.16	13.94	80
Maximum in 24 hours (inches).....	1.4	1.0	1.7	1.0	1.1	1.8	2.4	3.0	1.7	1.6	1.4	1.0	3.0	37
Mean number of days with more than 0.04 inch.....	13	10	11	10	9	9	11	13	10	11	12	13	132	40
WIND														
Direction (percentage of 0800 observations):														
North.....	3	3	4	8	7	10	6	5	3	2	2	3	5	20
Northeast.....	7	5	11	14	14	8	9	5	7	8	7	5	8	20
East.....	12	12	14	10	11	7	6	4	7	13	9	8	10	20
Southeast.....	10	13	11	9	10	6	8	8	9	15	14	11	10	20
South.....	15	21	19	15	14	13	13	16	18	21	22	23	18	20
Southwest.....	24	21	19	19	16	15	20	25	24	20	25	27	21	20
West.....	19	14	11	10	9	12	13	14	11	8	11	13	12	20
Northwest.....	8	9	10	13	17	27	22	20	16	9	9	8	14	20
Calm.....	2	2	1	2	2	2	3	3	5	4	1	2	2	20
Mean Beaufort force (0800).....	2.7	2.5	2.4	2.3	2.1	2.3	2.2	2.3	2.2	2.3	2.5	2.8	2.4	10
Direction (percentage of 1400 observations):														
North.....	3	5	6	9	8	8	8	6	7	5	4	3	6	20
Northeast.....	5	8	13	22	20	16	15	9	12	11	7	5	12	20
East.....	11	11	14	13	15	8	7	4	7	13	10	8	10	20
Southeast.....	10	11	9	6	8	5	6	6	7	13	13	10	9	20
South.....	11	15	12	8	8	6	8	8	13	18	18	21	12	20
Southwest.....	26	22	19	13	14	13	16	20	21	18	26	30	20	20
West.....	20	16	15	18	13	18	18	24	16	11	11	14	16	20
Northwest.....	12	10	10	10	13	25	21	21	15	10	9	7	13	20
Calm.....	2	2	2	1	1	1	1	2	2	1	2	2	2	20
Mean Beaufort force (1400).....	2.9	2.7	2.9	2.9	2.7	2.8	2.6	2.9	2.8	2.6	2.7	2.8	2.8	10
Mean number of days with gales.....	4	4	4	2	2	1	1	2	0.8	2	2	4	29	35
VISIBILITY														
0800:														
0-2 nautical miles.....	14	13	12	7	5	2	7	7	13	15	15	13	123	6-7
1400:														
0-2 nautical miles.....	16	8	7	3	3	1	2	1	5	7	11	15	79	6-7
Days with fog.....	7	5	4	2	1	0.7	0.6	1	2	4	7	8	43	35

LÜBECK.—*Lat. 53°52' N., long. 10°41' E., elevation 66 feet*

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of record
SEA LEVEL PRESSURE														
Average (millibars).....	1,014	1,013	1,010	1,011	1,013	1,013	1,012	1,011	1,014	1,012	1,012	1,011	1,012	45
TEMPERATURE														
Average (° F.).....	32	33	37	44	53	59	62	60	55	47	39	35	47	50
Average daily maximum (° F.).....	36	38	44	52	62	68	71	69	64	54	44	38	53	50
Average daily minimum (° F.).....	28	28	32	37	44	50	54	53	48	42	35	30	40	50
Extreme highest each month (° F.).....	56	60	70	83	93	94	95	94	90	76	64	56	95	49
Extreme lowest each month (° F.).....	-12	-17	2	19	28	32	39	37	27	19	6	4	-17	49
Minimum 32° or less (mean number of days).....	19.2	17.2	13.2	5.1	0.3	0	0	0	0	2.2	9.6	15.4	82.2	49
RELATIVE HUMIDITY														
Average percent (0800).....	92	90	86	81	78	77	81	83	85	89	91	92	85	49
Average percent (1400).....	90	85	77	68	65	65	69	71	72	79	86	90	76	49
CLOUD COVER														
Average amount (tenths).....	7.2	6.9	6.5	5.7	5.2	5.2	5.7	5.7	5.4	6.6	7.3	7.9	6.3	50
Less than $\frac{1}{10}$ average amount (mean number of days).....	3.2	3.0	3.7	4.9	6.7	5.4	4.3	3.6	5.2	3.2	2.0	1.5	46.7	49
More than $\frac{1}{10}$ average amount (mean number of days).....	15.7	13.0	12.6	8.9	6.7	6.7	7.8	7.3	7.5	11.8	14.6	18.1	130.7	49
PRECIPITATION														
Average amount (inches).....	1.65	1.38	1.61	1.46	2.01	2.32	3.07	2.99	2.21	2.28	1.89	1.65	24.92	80
Greatest amount (inches).....	4.33	3.94	3.78	3.39	4.45	3.94	5.71	5.47	5.08	4.21	4.49	5.08	31.18	40
Least amount (inches).....	0.63	0.32	0.24	0.04	0.28	0.67	0.98	0.95	0.39	0.35	0.20	0.39	18.82	40
Mean number of days with more than 0.004 inch.....	16.6	13.0	15.0	14.3	13.3	13.7	15.8	17.4	13.8	16.0	16.2	17.4	182.5	40
WIND														
Direction (percentage of all observations):														
North.....	5.8	7.4	8.9	11.4	15.3	15.0	12.7	7.6	9.7	6.6	6.0	6.1	9.4	44
Northeast.....	5.8	5.1	9.9	12.2	14.8	10.4	6.3	3.8	6.9	5.6	4.2	4.2	7.5	44
East.....	12.6	15.2	13.5	14.8	10.9	8.2	5.9	5.4	10.0	15.0	13.2	12.1	11.4	44
Southeast.....	7.9	7.8	7.7	6.1	4.8	3.1	3.7	3.6	5.2	7.8	8.7	8.0	6.1	44
South.....	8.5	10.0	9.5	6.9	5.8	5.3	6.0	8.0	7.6	11.2	12.8	12.0	8.6	44
Southwest.....	18.8	17.6	16.4	11.7	11.5	12.4	17.7	21.1	18.9	20.2	21.7	21.5	17.5	44
West.....	26.1	21.7	19.1	19.0	18.5	18.9	22.5	24.7	20.5	17.7	19.3	22.9	20.9	44
Northwest.....	7.9	8.0	10.0	11.2	11.0	17.8	14.0	12.8	9.2	6.4	6.2	6.4	10.0	44
Calm.....	6.6	7.2	5.0	6.7	7.4	8.9	11.8	13.0	12.0	9.5	7.9	6.8	8.6	44

ROSTOCK.—*Lat. 54°05' N., long. 12°04' E., elevation 89 feet*

Weather elements	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Years of record
SEA LEVEL PRESSURE														
Average (millibars).....	1,016	1,015	1,012	1,013	1,015	1,014	1,013	1,013	1,016	1,014	1,014	1,013	1,014	51
TEMPERATURE														
Average (°F.).....	31	32	37	44	53	59	62	61	56	47	38	34	46	51
Average daily maximum (°F.).....	36	37	43	52	62	68	71	69	64	53	43	37	53	51
Average daily minimum (°F.).....	27	27	31	36	43	49	53	53	48	41	34	30	39	51
Extreme highest each month (°F.).....	54	59	74	83	92	95	98	94	94	74	63	57	98	51
Extreme lowest each month (°F.).....	-19	-12	3	16	25	34	40	37	30	10	7	12	-19	51
RELATIVE HUMIDITY														
Average percent (0700).....	92	91	91	87	82	80	84	88	91	93	93	92	89	17
Average percent (1400).....	89	84	76	65	60	62	65	67	69	77	86	90	74	50
CLOUD COVER														
Average amount (tenths).....	7.3	7.1	6.8	6.0	5.4	5.8	6.2	6.1	5.6	6.8	7.4	7.9	6.5	50
Less than 2/10 average amount (mean number of days).....	2.3	2.3	2.8	3.9	5.1	3.6	2.6	2.3	3.9	2.0	1.7	1.2	33.7	50
More than 8/10 average amount (mean number of days).....	15.5	13.2	12.4	8.9	6.8	7.6	8.2	8.1	6.8	11.8	14.5	17.8	131.6	50
PRECIPITATION														
Average amount (inches).....	1.26	1.18	1.22	1.14	1.54	1.85	2.56	2.48	1.89	1.93	1.54	1.61	20.20	58-61
Greatest amount (inches).....	4.06	3.03	2.91	3.20	4.02	4.33	8.66	6.73	3.90	4.33	4.65	4.21	30.00	40
Least amount (inches).....	0.71	0.20	0.28	0.04	0.24	0.35	0.71	0.75	0.39	0.16	0.28	0.43	18.31	40
Maximum in 24 hours (inches).....	2.24	0.98	1.18	1.02	1.57	2.09	2.72	1.69	1.54	1.61	1.10	1.02	2.72	60-62
0.008 inch or more (mean number of days).....	12	11	12	10	11	12	13	14	12	13	14	14	149	60-62
Mean number of days with snow.....	8	7	5	2	0.1	0	0	0	0	0.4	3	6	32	51
WIND														
Direction (percentage of 0800 observations): ¹														
North.....	7.0	9.1	6.1	7.6	15.3	13.7	8.3	12.1	7.2	5.6	5.8	6.0	8.6	7
Northeast.....	5.6	8.1	8.9	7.6	9.3	3.9	1.9	4.2	4.3	4.2	5.8	4.2	3.7	7
East.....	10.3	10.7	13.5	15.3	13.4	8.3	3.7	7.5	7.2	7.9	13.4	8.9	10.0	7
Southeast.....	13.5	11.2	20.6	13.8	12.5	12.7	11.1	10.3	15.4	14.9	24.4	22.8	16.3	7
South.....	27.1	16.2	17.3	19.1	14.8	11.2	13.4	14.0	21.2	25.6	21.5	28.4	19.1	7
Southwest.....	20.1	14.7	12.1	11.4	8.8	14.0	18.5	16.8	21.6	25.1	14.3	15.8	16.1	7
West.....	8.9	20.3	11.7	10.0	8.3	21.5	25.0	16.4	6.7	7.0	7.6	6.5	12.5	7
Northwest.....	6.6	9.7	6.5	11.9	14.8	13.2	13.9	13.5	11.6	9.7	5.8	6.0	10.3	7
Calm.....	0.9	.....	3.3	3.3	2.8	1.5	4.2	5.2	4.8	.....	1.4	1.4	2.4	7
Direction (percentage of 1400 observations): ¹														
North.....	5.6	8.6	15.0	18.7	28.3	29.3	17.5	24.0	21.3	9.3	4.8	6.9	15.8	7
Northeast.....	4.2	5.6	7.5	7.2	9.0	4.8	1.9	1.8	1.4	4.2	7.7	3.7	4.9	7
East.....	8.4	9.1	11.3	9.6	12.7	6.3	2.4	6.0	5.8	4.7	13.4	7.9	8.1	7
Southeast.....	15.9	13.1	16.4	10.0	5.7	4.8	5.7	4.1	6.3	10.7	20.1	19.4	11.0	7
South.....	22.9	13.1	15.0	12.9	4.7	7.2	7.5	10.2	18.8	22.4	23.4	29.2	15.6	7
Southwest.....	19.2	12.6	8.5	6.2	5.2	3.8	13.3	6.9	12.6	20.6	15.3	18.5	11.9	7
West.....	14.9	24.3	15.0	20.6	14.1	20.7	27.5	22.1	18.4	18.7	9.1	8.8	17.9	7
Northwest.....	8.0	12.6	10.3	14.8	20.3	23.1	24.2	24.9	15.4	8.9	6.2	5.1	14.5	7
Calm.....	0.9	1.0	1.0	.....	.....	.....	.....	.....	.....	0.5	.....	0.5	0.3	7
34 knots or over (mean number of days).....	2	2	2	2	1.4	1.1	0.6	0.6	0.9	2	1.5	1.5	17	16
VISIBILITY														
Days with visibility less than ½ mile.....	2	2	3	0.7	0.5	0.3	0.4	0.4	2	4	3	3	21	25

¹ Warnemünde.

GLOSSARIES

DANISH

A

Aa	Rivulet.
Aas	Ridge.
Ankerplads	Anchorage.
Ankring forbudt	Anchoring prohibited.

B

Backe	Hill.
Bæk	Brook.
Bakke	Hill.
Banke	Bank.
Berg, bjerg, bjærg	Mountain.
Bølgebryder	Breakwater.
Bolværk	Wharf.
Borg	Castle, fortified place.
Bredning	Wide place in river or channel.
Bro	Bridge, pier.
Bugt	Bay, gulf.
By	Town.

D

Dal	Valley.
Dalben	Dolphin.
Delta	Delta.
Dokhavn	Wet dock, dock.
Drag	Isthmus.
Dyb	Deep.

E

Ebbestrøm	Ebb current.
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F

Fabrik	Factory.
Farvand	Fairway.
Favn	Fathom.
Færge	Ferry.
Fiskeri	Fisheries.
Fiskerihavn	Fishing harbor.
Fjord	Fjord.
Flak	Flat.
Flod	River.

Flodmunding	Estuary.
Flodstrøm	Flood current.
Fløjtetønde	Whistle buoy.
Flydedok	Floating dock.
Forbudt	Prohibited.
Forbudt areal	Prohibited area.
Fortøjtønde	Mooring buoy.
Fremtrædende	Prominent.
Fyr	Light.
Fyrskib	Lightship.
Fyrtaarn, fyrhus	Lighthouse.

G

Gaard	Farm.
Gab	Mouth, opening.
Gærde	Fence, hedge.
Gammel, gamle	Old.
Granskov	Coniferous woodland.
Grøn	Green.
Grund	Shoal.
Gul	Yellow.

H

Hage	Low point, spit.
Hale	Tail.
Hals	Throat.
Halvø	Peninsula.
Havn	Harbor, port, haven.
Høj	Hill, high.
Højvande	High water.
Holm	Islet.
Hoved	Headland.
Huk	Point.
Hvid	White.

I

Indløb	Entrance, inlet.
Indre	Inner.
Indsø	Lake.

J

Jernbane	Railroad.
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K

Kaj	Quay.
Kalk	Chalk.
Kalv	Detached islet.
Kap	Cape.
Karantæne	Quarantine.
Kendelig	Conspicuous.
Kirke	Church.
Klint	Cliff.
Klippe, klipper	Rock, rocks.
Klit	Dune, sandhill.
Klokketønde	Bell buoy.
Knold	Knoll.
Knude	Point.
Kyst	Coast.
Kystvagt	Coastguard.

L

Landsby	Village.
Landtunge	Neck of land.
Lang	Long.
Lavvande	Low water.
Lille	Little.
Løb	Channel.
Lods	Pilot.
Lodsstation	Pilot station.
Losseplads	Spoil ground.
Lund	Grove.
Lysbåd	Light float.
Lystønde	Light buoy.

M

Marsk	Marsh.
Mellem	Between.
Middel	Middle.
Middelgrund	Middle ground.
Minde	Mouth, outlet.
Misvisning	Variation.
Mole	Mole.
Mølle	Mill.
Mudder	Mud.
Munding	Mouth, outlet.

N

Næb	Bill.
Næs	Cape.
Nakke	Neck.
Nor	Shallow inlet, basin.
Nord	North.
Nordlig	Northern.
Nordøst	Northeast.
Nordvest	Northwest.
Ny	New.

O

Ø	Island.
Odde	Point.
Øst	East.
Østlig	Eastern.

P

Plade	Shoal.
Pulle	Shoal.
Pynt	Point.

R

Rådhus	Town hall.
Red	Roads, roadstead.
Rende	Channel.
Rev	Reef, sandbank.
Revle	Shoal, sandbank.
Rød	Red.
Røn	Rock, rocky ledge.

S

Sand	Sand.
Sejlløb	Channel.
Skanse	Fort, redoubt.
Skær	Rock.
Skærgård	Skerries.
Skibsbro	Jetty.
Skibsfartshindring	Obstruction.
Skibsværft	Shipyard.
Skorsten	Chimney.
Skov	Woods.
Skrænt	Bluff.
Slik	Ooze.
Slot	Castle.
Sluse	Lock.
Smaa	Small.
Snævrinjen	The narrows.
Søgræs	Seaweed.
Sort	Black.
Spærret område	Prohibited area.
Spidstønde	Conical buoy.
Spir	Spire.
Spirstønde	Spar buoy.
Stad	Town.
Stang	Pole.
Sten	Stones.
Stor, store	Great, large.
Store sten	Boulders.
Strand	Beach, shore.
Strøm	Current.
Stumpestønde	Can buoy.
Sund	Sound.
Svajebassin	Turning basin.

Syd.....	South.
Sydlig.....	Southern.
Sydøst.....	Southeast.
Sydvest.....	Southwest.

T

Taarn.....	Tower.
Tang.....	Seaweed.
Tange.....	Narrow isthmus, neck of land.
Tidevand.....	Tide.
Told, toldbod.....	Customs, customs office.
Top.....	Summit.
Tørdok.....	Drydock.

A

Abgersuchtes gebiet.....	Swept area.
Alt-; e, er, es.....	Old.
Ankerplatz.....	Anchorage.
Anlege stelle.....	Landing place.
Ansicht.....	View.
Ansteuerungstonne.....	Landfall buoy.
Au.....	Brook, rivulet.
Auffällig.....	Conspicuous.
Aussen.....	Outer, outside.

B

Baggerrinne.....	Dredged channel.
Bai.....	Bay, cove.
Bake, baken.....	Beacon, beacons.
Balje.....	Channel between sands.
Berg.....	Mountain.
Binnen.....	Inner.
Blau.....	Blue.
Bodden.....	Bay.
Brücke.....	Bridge.
Bucht.....	Bay.
Busch.....	Bush.

D

Dalben.....	Dolphin.
Damm.....	Dam, embankment.
Deich.....	Dike.
Deviationsbake.....	Deviation beacon.
Dorf.....	Village.
Drehbrücke.....	Drawbridge.
Düne.....	Dune.
Durchfahrt.....	Passage, channel.

E

Eck.....	Angle, corner.
Ehe.....	Channel for small craft.

U

Uddybet.....	Dredged.
Undervandskabel.....	Submarine cable.

V

Varde.....	Cairn.
Varehus.....	Warehouse.
Vest.....	West.
Vestlig.....	Western.
Vig.....	Cove.
Vrag.....	Wreck.
Vragtønde.....	Wreck buoy.

Y

Ydre.....	Outer.
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GERMAN

Einfahrt.....	Entrance.
Eiland.....	Island.
Eisenbahn.....	Railway.
Eissignale.....	Ice signals.

F

Fähre.....	Ferry.
Fahrwasser.....	Navigable water, channel.
Festmachetonne.....	Mooring buoy.
Feuerschiff.....	Lightship.
Fischerei.....	Fishery.
Fischstaken.....	Fish weirs.
Fluss.....	River.
Förde.....	Fjord.
Funkmast.....	Radio mast.

G

Gat.....	Channel between banks.
Gebiet.....	Area.
Gefahrssignale.....	Danger signals.
Gelb.....	Yellow.
Gelöscht.....	Extinguished.
Golf.....	Gulf.
Grenze.....	Boundary, limit.
Gross-; e, er, es.....	Great.
Grün.....	Green.
Grund.....	Shoal.

H

Hafen.....	Harbor.
Hafengrenze.....	Harbor limit.
Hafensignale.....	Port signals.
Haff.....	Lagoon, fresh water lake.
Haken.....	Hooked point.
Halbinsel.....	Peninsula.
Haus.....	House.
Höft.....	Foreland.

Höhe	Height.
Holz	A wood.
Höved	Headland.
Hügel	Hill, hillock.
Huk	Cape, point, head.

I

Insel	Island.
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K

Kanal	Canal.
Kap	Cape.
Kapelle	Chapel.
Kartennull	Chart datum.
Kirche	Church.
Klein	Small.
Klippe	Cliff, rock.
Kreisfunkfeuer	Radiobeacon.
Kuppel	Cupola.
Kurhaus	Bathing pavilion.
Kustenwache	Coastguard.

L

Ladeplatz	Wharf.
Landenge	Isthmus.
Landungsbrücke	Pier, jetty.
Leuchtonne	Light buoy.
Leuchtturm	Lighthouse.
Lotse	Pilot.
Lotsenstelle	Pilot station.

M

Marsch	Marsh.
Meer	Sea.
Mittel	Middle.
Mühle	Mill.
Münde, Mündung	Mouth of river, etc

N

Nachrichten für Seefahrer ..	Notices to Mariners.
Nebel	Fog.
Neue	New.
Nieder	Lower.
Nis	Cape, point.
Nord	North.

O

Ober	Upper.
Ort	Place.
Ortschaft	Town, Village.
Ost	East.
Ostsee	The Baltic.

P

Pegel	Tide gage.
Platz	Place.
Poller	Bollard.
Punkt	Position, point.

R

Radarstelle	Coastal radar station.
Rathaus	Town hall.
Reede	Roadstead, road.
Rettingstelle	Lifesaving station.
Riff	Reef.
Riffgrund	Rocky ground.
Rinne	Narrow channel.
Rot	Red.

S

Sand	Sand.
Schiffahrtshindernis	Obstruction to navigation.
Schleuse	Lock, sluice.
Schleusensignale	Lock signals.
Schloss	Castle.
Schornstein	Chimney, smokestack.
Schwimmdock	Floating drydock.
Schwingbrücke	Swing bridge.
Schwartz	Black.
See	Lake, sea.
Seegat	Entrance channel.
Seetang, seegras	Kelp, seaweed.
Spiegel	Reflector.
Spitze	Summit, peak, point.
Stadt	City, town.
Stein	Stone.
Strand	Beach, shore.
Strom	Current, stream.
Stromkabelung	Overfalls, tide rips.
Strumsignale	Storm signals.
Sud	South.
Sumpf	Swamp, bog.
Sund	Sound.

T

Tief	Deep.
Tonne	Buoy.
Trockendock	Drydock.
Turm	Tower.

U

Ufer	Bank of a river, shore.
Unter	Under.
Untersuchungsankerplatz ..	Examination anchorage.
Unterwasserkabel	Submarine cable.
Untiefe	Bank, shoal.

V

Verboten.....	Prohibited.
Versandet.....	Silted up, shoaled.

W

Wald.....	Wood, forest.
Wasserstände.....	Water level.
Wasserstelle.....	Watering place.
Weiss.....	White.
West.....	West.

Wiek.....	Bay.
Windmotor.....	Windwheel.
Windmühle.....	Windmill.
Wrack.....	Wreck.

Z

Zeitweilig.....	Temporary.
Zerstört.....	Destroyed.
Zollgrenze.....	Customs boundary.
Zugbrücke.....	Lift bridge.

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Feet	0	1	2	3	4	5	6	7	8	9
0	0.00	0.30	0.61	0.91	1.22	1.52	1.83	2.13	2.44	2.74
10	3.05	3.35	3.66	3.96	4.27	4.57	4.88	5.18	5.49	5.79
20	6.10	6.40	6.71	7.01	7.32	7.62	7.92	8.23	8.53	8.84
30	9.14	9.45	9.75	10.06	10.36	10.67	10.97	11.28	11.58	11.89
40	12.19	12.50	12.80	13.11	13.41	13.72	14.02	14.33	14.63	14.93
50	15.24	15.54	15.85	16.15	16.46	16.76	17.07	17.37	17.68	17.98
60	18.29	18.59	18.90	19.20	19.51	19.81	20.12	20.42	20.73	21.03
70	21.34	21.64	21.95	22.25	22.55	22.86	23.16	23.47	23.77	24.08
80	24.38	24.69	24.99	25.30	25.60	25.91	26.21	26.52	26.82	27.13
90	27.43	27.74	28.04	28.35	28.65	28.96	29.26	29.57	29.87	30.17

FATHOMS TO METERS

Fathoms	0	1	2	3	4	5	6	7	8	9
0	0.00	1.83	3.66	5.49	7.32	9.14	10.97	12.80	14.63	16.46
10	18.29	20.12	21.95	23.77	25.60	27.43	29.26	31.09	32.92	34.75
20	36.58	38.40	40.23	42.06	43.89	45.72	47.55	49.38	51.21	53.03
30	54.86	56.69	58.52	60.35	62.18	64.01	65.84	67.67	69.49	71.32
40	73.15	74.98	76.81	78.64	80.47	82.30	84.12	85.95	87.78	89.61
50	91.44	93.27	95.10	96.93	98.75	100.58	102.41	104.24	106.07	107.90
60	109.73	111.56	113.39	115.21	117.04	118.87	120.70	122.53	124.36	126.19
70	128.02	129.85	131.67	133.50	135.33	137.16	138.99	140.82	142.65	144.47
80	146.30	148.13	149.96	151.79	153.62	155.45	157.28	159.11	160.93	162.76
90	164.59	166.42	168.25	170.08	171.91	173.74	175.56	177.39	179.22	181.05

METERS TO FEET

Meters	0	1	2	3	4	5	6	7	8	9
0	0.00	3.28	6.56	9.84	13.12	16.40	19.68	22.97	26.25	29.53
10	32.81	36.09	39.37	42.65	45.93	49.21	52.49	55.77	59.06	62.34
20	65.62	68.90	72.18	75.46	78.74	82.02	85.30	88.58	91.86	95.14
30	98.42	101.71	104.99	108.27	111.55	114.83	118.11	121.39	124.67	127.95
40	131.23	134.51	137.80	141.08	144.36	147.64	150.92	154.20	157.48	160.76
50	164.04	167.32	170.60	173.88	177.16	180.45	183.73	187.01	190.29	193.57
60	196.85	200.13	203.41	206.69	209.97	213.25	216.54	219.82	223.10	226.38
70	229.66	232.94	236.22	239.50	242.78	246.06	249.34	252.62	255.90	259.19
80	262.47	265.75	269.03	272.31	275.59	278.87	282.15	285.43	288.71	291.99
90	295.28	298.56	301.84	305.12	308.40	311.68	314.96	318.24	321.52	324.80

METERS TO FATHOMS

Meters	0	1	2	3	4	5	6	7	8	9
0	0.00	0.55	1.09	1.64	2.19	2.73	3.28	3.83	4.37	4.92
10	5.47	6.01	6.56	7.11	7.66	8.20	8.75	9.30	9.84	10.39
20	10.94	11.48	12.03	12.58	13.12	13.67	14.22	14.76	15.31	15.86
30	16.40	16.95	17.50	18.04	18.59	19.14	19.68	20.23	20.78	21.33
40	21.87	22.42	22.97	23.51	24.06	24.61	25.15	25.70	26.25	26.79
50	27.34	27.89	28.43	28.98	29.53	30.07	30.62	31.17	31.71	32.26
60	32.81	33.36	33.90	34.45	35.00	35.54	36.09	36.64	37.18	37.73
70	38.28	38.82	39.37	39.92	40.46	41.01	41.56	42.10	42.65	43.20
80	43.74	44.29	44.84	45.38	45.93	46.48	47.03	47.57	48.12	48.67
90	49.21	49.76	50.31	50.85	51.40	51.95	52.49	53.04	53.59	54.13

U.S. NAVAL OCEANOGRAPHIC OFFICE SAILING DIRECTIONS

New No.	Old No.	Ed.-Date	
			AREA 1—CANADA, GREENLAND, AND ICELAND
10	175	6-1960	BRITISH COLUMBIA, VOL. I. Strait of Juan de Fuca and Inner Passages to mcape Caution.
11	176	6-1962	BRITISH COLUMBIA, VOL. II. Cape Caution to Alaska.
12	99	9-1952	NOVA SCOTIA. The Bay of Fundy and Cape Breton Island.
13	100	7-1951	THE GULF AND RIVER ST. LAWRENCE. Western shores of the gulf and the river and seaway to Cornwall Island.
14	73	8-1958	NEWFOUNDLAND. Includes Strait of Belle Isle and St. Pierre and Miquelon Islands.
15	77	1-1965	LABRADOR AND HUDSON BAY. Labrador northward of St. Lewis Sound, Hudson Strait and Hudson Bay.
16	76	2-1951	BAFFIN BAY AND DAVIS STRAIT. Includes northern Greenland eastward to Cape Morris Jesup.
17	75	2-1951	EAST GREENLAND AND ICELAND. Includes the island of Jan Mayen.
			AREA 2—LATIN AMERICA AND ANTARCTICA
20	130	5-1952	EAST COASTS OF CENTRAL AMERICA AND MEXICO. Includes north coast of Columbia.
21	128	3-1958	THE WEST INDIES, VOL. I. Bermuda, Bahamas, and Greater Antilles.
22	129	7-1963	THE WEST INDIES, VOL. II. Lesser Antilles and Venezuela.
23	172	5-1952	SOUTH AMERICA, VOL. I. East coast from Venezuelan border to and including Rio de la Plata.
24	173	5-1952	SOUTH AMERICA, VOL. II. East and west coasts between Rio de la Plata and Cabo Tres Montes, including Falkland, South Georgia, and South Sandwich Islands.
25	174	6-1960	SOUTH AMERICA, VOL. III. West coast between Gulf of Panama and Cabo Tres Montes.
26	84	9-1951	WEST COASTS OF MEXICO AND CENTRAL AMERICA. The United States border to Columbian border.
27	138	2-1960	ANTARCTICA. Includes islands south of latitude 60°.
			AREA 3—BRITISH ISLES AND NORTHWESTERN EUROPE
30	146	5-1962	IRELAND.
31	144	4-1952	SOUTH COAST OF ENGLAND. Scilly Isles to North Foreland.
32	145	4-1951	WEST COASTS OF ENGLAND AND WALES. Lands End to Mull of Galloway, including Isle of Man.
33	147	4-1951	WEST COAST OF SCOTLAND. Mull of Galloway to Cape Wrath, including the Hebrides.
34	149	3-1950	NORTH AND EAST COASTS OF SCOTLAND. Cape Wrath of Fife Ness, including Orkney, Shetland, and Faeroe Islands.
35	150	5-1951	EAST COAST OF ENGLAND. Fife Ness to North Foreland, including the Firth of Forth.
36	135	5-1959	EASTERN SHORES OF THE NORTH SEA. Dunkerque to Skagen.
37	132	4-1951	NORTH COAST OF FRANCE. Northwestern end of France to Belgium.
38	133	5-1951	BAY OF BISCAY. West coast of France and north coast of Spain.
			AREA 4—BALTIC, SCANDINAVIA, AND NORTHERN U.S.S.R.
40	140	1-1955	NORTHERN AND EASTERN SHORES OF THE SKAGERRAK. Lindesnes to Marstrandsfjorden.
41	141A	1-1956	KATTEGAT AND THE SOUND. Skagen to Falsterbo, including Fakse Bugt.
42	141B	1-1958	THE BALTIC, VOL. I. Store Baelt, Lille Baelt, and coast from Denmark to Kap Arkona.
43	142	4-1951	THE BALTIC, VOL. II. Baltic Sea from Falsterbo Udde and Kap Arkona to the Gulfs of Finland and Bothnia.

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New Old Ed.-Date
No. No.

44	143	3-1952	THE BALTIC, VOL. III. Gulfs of Finland and Bothnia.
45	139	1-1955	SOUTHWEST COAST OF NORWAY. Lindesnes to Fedje.
46	136	4-1952	NORTHWEST AND NORTH COASTS OF NORWAY. Fedjeosen to Nye-myetski Point. U.S.S.R., including Svalbard Archipelago.
47	137A	1-1953	NORTHERN U.S.S.R., VOL. I. Mys Nemetskiy to Mys Kanai Nos.
48	137B	1-1954	NORTHERN U.S.S.R., VOL. II. Mys Kanin Nos to Ostrov Dikson.
49	137C	1-1954	NORTHERN U.S.S.R., VOL. III. Ostrov Dikson to Mys Shmidta.

AREA 5—MEDITERRANEAN AND WESTERN AFRICA

50	105	4-1951	SOUTHWEST COAST OF AFRICA. Cape Palmas to Cape of Good Hope.
51	134	6-1952	WEST COASTS OF SPAIN, PORTUGAL, AND NORTHWEST AFRICA AND OFF-LYING ISLANDS. Includes Azores, Madeira, Canary and Cape Verde Islands, and Africa southward to Cape Palmas.
52	151	4-1952	THE MEDITERRANEAN, VOL. I. Strait of Gibraltar, Spain, Balearic Islands, northern Africa to Ras Agedir.
53	152	5-1958	THE MEDITERRANEAN, VOL. II. France, west coast of Italy, Corsica, Sardinia, and Sicily, including adjacent islands.
54	153	3-1951	THE MEDITERRANEAN, VOL. III. Southeast Italy, the Adriatic, and western Greece to Akra Tainaron.
55	154A	3-1963	THE MEDITERRANEAN, VOL. IV. Libya, Egypt, Israel, Lebanon, Syria, and southern Turkey, including islands of Cyprus, Rodhos, Karpathos, and Crete.
56	154B	2-1952	THE MEDITERRANEAN, VOL. V. The Aegean Sea.

AREA 6—MIDDLE EAST, EASTERN AFRICA, AND SOUTHERN ASIA

60	156	4-1951	SOUTHEAST COAST OF AFRICA. Cape of Good Hope to Ras Hafun.
61	157	5-1965	THE RED SEA AND GULF OF ADEN. Includes Suez Canal, Gulf of Suez, Africa north of Ras Hafun, Suqutra, and Arabian coast eastward to Ra's al Hadd.
62	158	5-1960	THE PERSIAN GULF. Includes Gulf of Oman and northern shore of Arabian Sea eastward to Ras Muari.
63	159	4-1951	WEST COAST OF INDIA. Includes Ceylon and Maldiva and Laccadive Islands.
64	160	5-1966	BAY OF BENGAL. Point Calimere to Laem Pak Phra and the Andaman and Nicobar Islands.
65	161	4-1952	SOUTH INDIAN OCEAN. Madagascar and islands westward of longitude 90°.

AREA 7—AUSTRALIA AND SOUTHWEST PACIFIC

70	162	4-1951	MALACCA STRAIT AND SUMATRA. Central and western Sumatra and southwestern Malay Peninsula.
71	126	5-1951	SOENDA STRAIT AND WESTERN AND NORTHEAST COASTS OF BORNEO AND OFF-LYING ISLANDS.
72	163	5-1962	JAVA; LESSER SUNDAS; SOUTH, SOUTHEAST, AND EAST COASTS OF BORNEO; AND CELEBES. Excludes western end of Java between Tandjung Tjankuang and Udjung Krawang.
73	164	4-1952	NEW GUINEA. Includes Halmahera and islands southward.
74	170	3-1952	NORTH AND WEST COASTS OF AUSTRALIA. Cape York to Cape Leeuwin.
75	169	4-1954	EAST COAST OF AUSTRALIA. Sydney to Cape York, including islands in the Coral Sea.
76	168	3-1952	SOUTHEAST COAST OF AUSTRALIA. Cape Northumberland to Port Jackson, including Tasmania.
77	167	3-1950	SOUTH COAST OF AUSTRALIA. Cape Leeuwin to Cape Northumberland.

U.S. NAVAL OCEANOGRAPHIC OFFICE SAILING DIRECTIONS

New No.	Old No.	Ed.-Date	
78	171	3-1952	NEW ZEALAND. Includes Kermadec Islands and islands eastward and southward of New Zealand.
			AREA-8—NORTH AND SOUTH PACIFIC
80	166	6-1952	THE PACIFIC ISLANDS, VOL. III. The south-central groups.
81	165B	1-1952	THE PACIFIC ISLANDS, VOL. II. Santa Cruz and New Hebrides groups, New Caledonia, and adjacent islands.
82	165A	2-1964	THE PACIFIC ISLANDS, VOL. I. Western groups, including the Solomon Islands.
			AREA 9—FAR EAST, PHILIPPINE ISLANDS, AND EASTERN U.S.S.R.
90	78	1-1955	PHILIPPINE ISLANDS, VOL. I. Northern islands, including western Negros and northern Samar.
91	79	1-1956	PHILIPPINE ISLANDS, VOL. II. Central islands, including eastern Negros, southern Samar, and northern Mindanao.
92	80	1-1956	PHILIPPINE ISLANDS, VOL. III. Southern Mindanao, Sula Archipelago, and Palawan.
93	125	5-1957	WESTERN SHORES OF SOUTH CHINA SEA. Sitapore Strait to Hong Kong.
94	124	6-1959	COAST OF CHINA. Coast northward of Hong Kong to Yalu Chiang, and island of Taiwan.
95	123B	2-1951	JAPAN, VOL. II (SOUTHERN PART). The Naikai islands southward, including Nansei Shoto, and Tsushima.
96	123A	2-1951	JAPAN, VOL. I (NORTHERN PART). Honshu, except the Naiki, Hokkaido, Chishima Retto, and Nanpo Shoto.
97	122B	2-1951	SOUTHEAST COAST OF SIBERIA AND KOREA. Sakhalinskiy Zaliv to Yalu Chiang, including Sakhalin.
98	122A	2-1951	EAST COAST OF SIBERIA. Mys Otto Shmidta to Sakhalinskiy Zaliv, including Ostrov Vrangelya.

★ U. S. GOVERNMENT PRINTING OFFICE—1966: 251-595X7

U.S. NAVY HYDROGRAPHIC OFFICE SAILING DIRECTIONS

The Sailing Directions have been renumbered in accordance with a system of area identification, the first digit denoting the general area and the last digit the specific volume within the area.

New No.	Old No.	
AREA 1—CANADA, GREENLAND, AND ICELAND		
10	175	British Columbia, Vol. I. The Coast of British Columbia from the Strait of Juan de Fuca to Cape Caution, including Vancouver Island and the inner passages. Sixth edition, 1960.
11	176	British Columbia, Vol. II. The Coast of British Columbia from Cape Caution to Portland Inlet, including the Queen Charlotte Islands and Dixon Entrance. Fifth edition, 1952.
12	99	Nova Scotia. The Bay of Fundy and Cape Breton Island. Ninth edition, 1952.
13	100	The Gulf and River St. Lawrence. Seventh edition, 1951.
14	73	Newfoundland. The Island of Newfoundland, The Strait of Belle Isle, and the Islands of St. Pierre and Miquelon. Eighth edition, 1958.
15	77	Northern Canada. The coast of Labrador Northward of St. Lewis Sound, the Northern Coast of the Canadian Mainland, and the Canadian Archipelago. Second edition, 1951.
16	76	Baffin Bay and Davis Strait. Comprising The West Coast of Greenland from the Eastern Entrance of Prince Christian Sound to Cape Morris Jesup and The East Coasts of Baffin, Bylot, Devon, and Ellesmere Islands from Resolution Island to Cape Joseph Henry. Second edition, 1951.
17	75	East Greenland and Iceland. Greenland from Prince Christian Sound to Cape Morris Jesup, Iceland, and the island of Jan Mayen. Second edition, 1951.

AREA 2—LATIN AMERICA AND ANTARCTICA		
20	130	East Coasts of Central America and Mexico. Including north Coast of Colombia. Fifth edition, 1952.
21	128	The West Indies, Vol. I. Bermuda, The Bahama Islands, and The Greater Antilles. Third edition, 1958.
22	129	The West Indies, Vol. II. The Lesser Antilles and the coast of Venezuela. Sixth edition, 1949.
23	172	South America, Vol. I. East coast from the Orinoco River to and including Rio de la Plata. Fifth edition, 1952.
24	173	South America, Vol. II. Southern part from the Rio de la Plata to Cabo Tres Montes, including the islands north of latitude 60° south. Fifth edition, 1952.
25	174	South America, Vol. III. West coast from Gulf of Panama to Cabo Tres Montes, including off-lying islands. Sixth edition, 1960.
26	84	West Coasts of Mexico and Central America. The United States to Colombia, including the Gulfs of California and Panama. Ninth edition, 1951.
27	138	Antarctica. Including the Off-lying Islands South of Latitude 60°. Second edition, 1960.

AREA 3—BRITISH ISLES AND NORTHWESTERN EUROPE		
30	146	Ireland. Fourth edition, 1951.
31	144	South Coast of England. The Scilly Isles to North Foreland. Fourth edition, 1952.
32	145	West Coasts of England and Wales. Lands End to the Mull of Galloway Including the Isle of Man. Fourth edition, 1951.
33	147	West Coast of Scotland. Mull of Galloway to Cape Wrath, including The Hebrides. Fourth edition, 1951.
34	149	North and East Coasts of Scotland. Cape Wrath to Fife Ness and including the Orkney, Shetland, and Faeroe Islands. Third edition, 1950.
35	150	East Coast of England. Fife Ness to North Foreland, Including the Firth of Forth and the Thames. Fifth edition, 1951.
36	135	Eastern Shores of the North Sea. Dunkerque to the Skagen. Fifth edition, 1959.
37	132	North Coast of France. The Northwestern extremity of France to the Belgian Frontier. Fourth edition, 1951.
38	133	Bay of Biscay. West Coast of France and the North Coast of Spain from Ile d'Ouessant to Cabo Torinana. Fifth edition, 1951.

AREA 4—BALTIC, SCANDINAVIA, AND NORTHERN U.S.S.R.		
40	140	Northern and Eastern Shores of the Skagerrak. Lindesnes to Marstrandsfjorden. First edition, 1955.
41	141A	Kattegat and The Sound. Skagen to Falsterbo including Kakse Bugt. First edition, 1956.
42	141B	The Baltic, Vol. I. Store Baelt, Lille Baelt, and the German coast from the Danish frontier to Kap Arkona. First edition, 1958.
43	142	The Baltic, Vol. II. The Baltic Sea From Falsterbo Udde and Cape Arkona to the Entrances of the Gulfs of Finland and Bothnia. Fourth edition, 1951.
44	143	The Baltic, Vol. III. The Gulf of Finland, the Aland Islands, and the Gulf of Bothnia. Third edition, 1952.
45	139	Southwest Coast of Norway. Lindesnes to Fedje. First edition, 1955.
46	136	Northwest and North Coasts of Norway. Fedjeosen to U.S.S.R. Frontier and thence to Nyemyet-ski Point Including Svalbard Archipelago. Fourth edition, 1952.
47	137A	Northern U.S.S.R., Vol. I. Mys Nemetskiy to Mys Kanin Nos. First edition, 1953.
48	137B	Northern U.S.S.R., Vol. II. Mys Kanin Nos to Ostrov Dikson. First edition, 1954.
49	137C	Northern U.S.S.R., Vol. III. Ostrov Dikson to Mys Shmidta. First edition, 1954.

AREA 5—MEDITERRANEAN AND WESTERN AFRICA		
50	105	Southwest Coast of Africa. Cape Palmas to the Cape of Good Hope. Fourth edition, 1951.
51	134	West Coasts of Spain, Portugal, and Northwest Africa and Off-lying Islands. The Coasts of Spain and Portugal from Cabo Torinana to Cabo Trafalgar, the Madeira Group, the Azores, Canary Islands, Cape Verde Islands, and the West Coast of Africa from Cabo Espartel to Cape Palmas. Sixth edition, 1952.

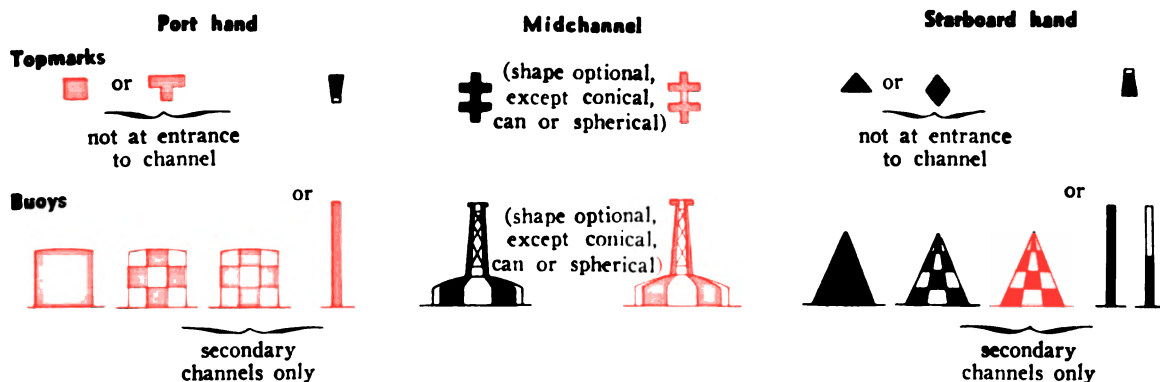
U. S. NAVY HYDROGRAPHIC OFFICE SAILING DIRECTIONS

New No. Old No.		AREA 5—MEDITERRANEAN AND WESTERN AFRICA (Continued)
52	151	The Mediterranean, Vol. I. Strait of Gibraltar, south and southeast coast of Spain, the Balearic Islands, and the north coast of Africa from Cabo Espartel to Ras Agadir. Fourth edition, 1952.
53	152	The Mediterranean, Vol. II. The South Coast of France, the West Coast of Italy, and the Islands of Corsica, Sardinia, and Sicily, Including the Neighboring islands. Fifth edition, 1958.
54	153	The Mediterranean, Vol. III. The Southeast Coast of Italy, The Shores of the Adriatic, and the Western Coast of Greece to Akra Tainaron. Third edition, 1951.
55	154A	The Mediterranean, Vol. IV. Libya, Egypt, Turkey (Southern Coast), Syria, Lebanon, Israel, and the Islands of Crete, Scarpento, Rhodes, and Cyprus. Second edition, 1952.
56	154B	The Mediterranean, Vol. V. Aegean Sea. Second edition, 1952.
		AREA 6—MIDDLE EAST, EASTERN AFRICA, AND SOUTHERN ASIA
60	156	Southeast Coast of Africa. Cape of Good Hope to Ras Hafun. Fourth edition, 1951.
61	157	Red Sea and the Gulf of Aden. Including The Suez Canal, the Gulf of Suez, the Gulf of Akaba, the southeastern coast of Arabia as far as Ras al Hadd, the coast of Africa from Ras Asir to Ras Hafun, and the islands eastward of Ras Asir. Fourth edition, 1952.
62	158	The Persian Gulf. Including the Gulf of Oman, and the Northern Shore of the Arabian Sea as Far Eastward as Ras Muari. Fifth edition, 1960.
63	159	West Coast of India. Including Ceylon, and the Maldive and Laccadive Islands. Fourth edition, 1951.
64	160	Bay of Bengal. The Coasts of India, Pakistan, Burma, and Thailand from Calimere Point to Salang Island—the Andaman Islands, Nicobar Islands, and the Mergui Archipelago. Fourth edition, 1951.
65	161	South Indian Ocean. Including Madagascar and the islands west of longitude 90° east. Fourth edition, 1952.
		AREA 7—AUSTRALIA AND SOUTHWEST PACIFIC
70	162	Malacca Strait and Sumatra. Malacca Strait and West Coast of Sumatra with Adjacent Islands. Fourth edition, 1951.
71	126	Soenda Strait and the Western and Northeast Coasts of Borneo and Off-lying Islands. Fifth edition, 1951.
72	163	Celebes, Southeast Borneo, Java and Islands East of Java. Except the western coast of Java from Java Head to Djakarta. Fourth edition, 1952.
73	164	New Guinea. Including the Islands eastward of Celebes and Timor. Fourth edition, 1952.
74	170	North and West Coasts of Australia. From the western approach to Torres Strait to Cape Leeuwin. Third edition, 1952.
75	169	The East Coast of Australia. Sydney Harbor to Cape York, including the islands of the Coral Sea, Torres Strait, and the Inner Route. Fourth edition, 1954.
76	168	Southeast Coast of Australia. Cape Northumberland to and including Port Jackson, Bass Strait and Tasmania. Third edition, 1950.
77	167	South Coast of Australia. Cape Leeuwin to Cape Northumberland. Third edition, 1950.
78	171	New Zealand. Kermadec Islands, Chatham Islands, and the off-lying islands southeastward and southward of New Zealand. Third edition, 1952.
		AREA 8—NORTH AND SOUTH PACIFIC
80	166	The Pacific Islands, Vol. III. Eastern Groups. Sixth edition, 1952.
81	165B	The Pacific Islands, Vol. II. The Santa Cruz Group, the New Hebrides, New Caledonia, and adjacent islands. First edition, 1952.
82	165A	The Pacific Islands, Vol. I. Western Groups, including the Solomon Islands. First edition, 1952.
		AREA 9—FAR EAST, PHILIPPINE ISLANDS, AND EASTERN U.S.S.R.
90	78	Philippine Islands, Vol. I. Luzon, Mindoro, Masbate, Panay, The West Side of Negros, and The North Coast of Samar. First edition, 1955.
91	79	Philippine Islands, Vol. II. Cebu, Bohol, Leyte, East Coast of Negros, East, South, and West Coasts of Samar, North and Northeast Coasts of Mindanao. First edition, 1956.
92	80	Philippine Islands, Vol. III. Palawan and Islands and Dangers Northeastward, Palawan Passage, Islands and Dangers in Sulu Sea, Sulu Archipelago, and East and South Coasts on Mindanao. First edition, 1956.
93	125	Western Shores of the South China Sea. From Singapore Strait to and including Hong Kong. Fifth edition, 1957.
94	124	Coast of China. Fattau Point (Approach to Hong Kong) to and Including the Yalu Chiang—Taiwan (Formosa) and P'eng-hu Lieh-tao (the Pescadores Islands)—the Ch'ang Chiang (Yangtze River). Sixth edition, 1959.
95	123B	Japan, Vol. II (Southern Part). The Naikai and Its Entrances, Namely, Kii Suido, Bungo Suido, and Shimonoseki Kaikyo; Shikoyu; Kyushu and Its Off-lying Islands; the Nansei Shoto; and Tsushima. Second edition, 1951.
96	123A	Japan, Vol. I (Northern Part). The Coasts of Honshu, except the Inland Sea Area, The Island of Hokkaido; The Chishima Retto (Kuril Islands); and the Islands of Nanpo Shoto, consisting of the Izu, Ogasawara (Bonin), and Kazan (Volcano) Groups. Second edition, 1951.
97	122B	Southeast Coast of Siberia and Korea. Sakhalinskiy Zaliv (Sakhalin Gulf) to the Yalu River, Including Sakhalin. Second edition, 1951.
98	122A	East Coast of Siberia. Mys Otto Shmidt to Sakhalinskiy Zaliv (Sakhalin Gulf). Second edition, 1951.

UNIFORM SYSTEM OF MARITIME BUOYAGE

LATERAL SYSTEM

FAIRWAYS and CHANNELS



Lights

RED : Single flashing or occulting or group flashing or group occulting with a number of flashes or occultations up to four; or

WHITE : Group flashing (2 or 4) or group occulting (2 or 4); or

Both **RED** and **WHITE** with the above characteristics.

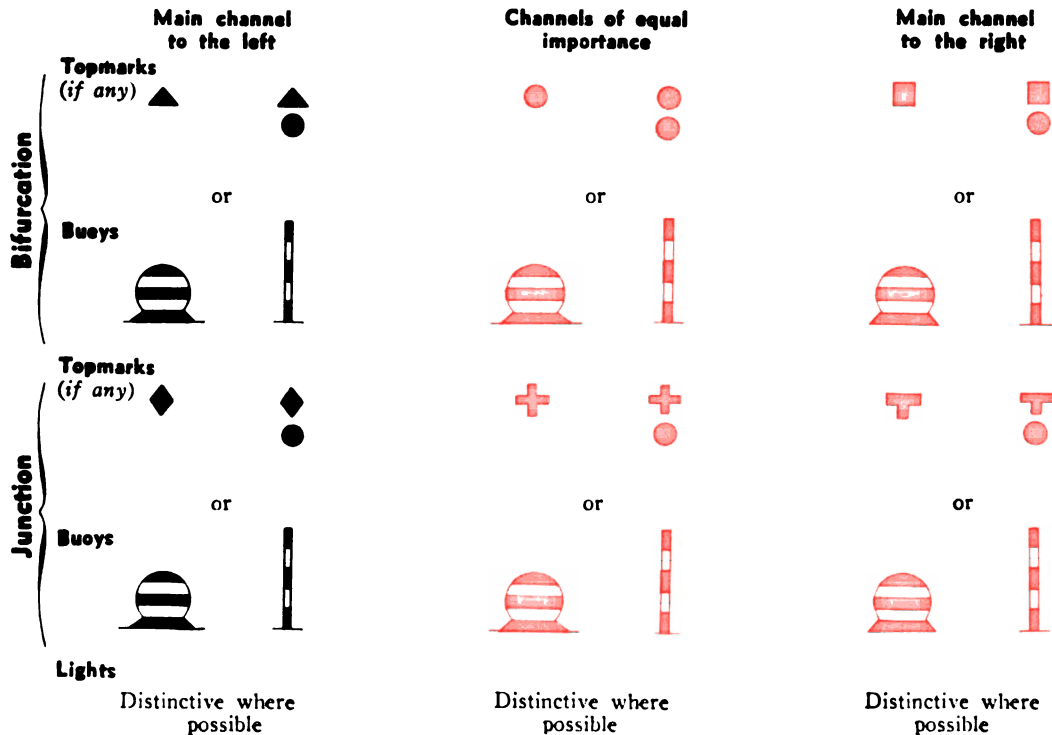
Differing from neighboring lights.

WHITE : Single flashing or occulting, or group flashing (3) or group occulting (3); or

GREEN : Of a character different from wreck marking; or

Both **WHITE** and **GREEN** with the above characteristics.

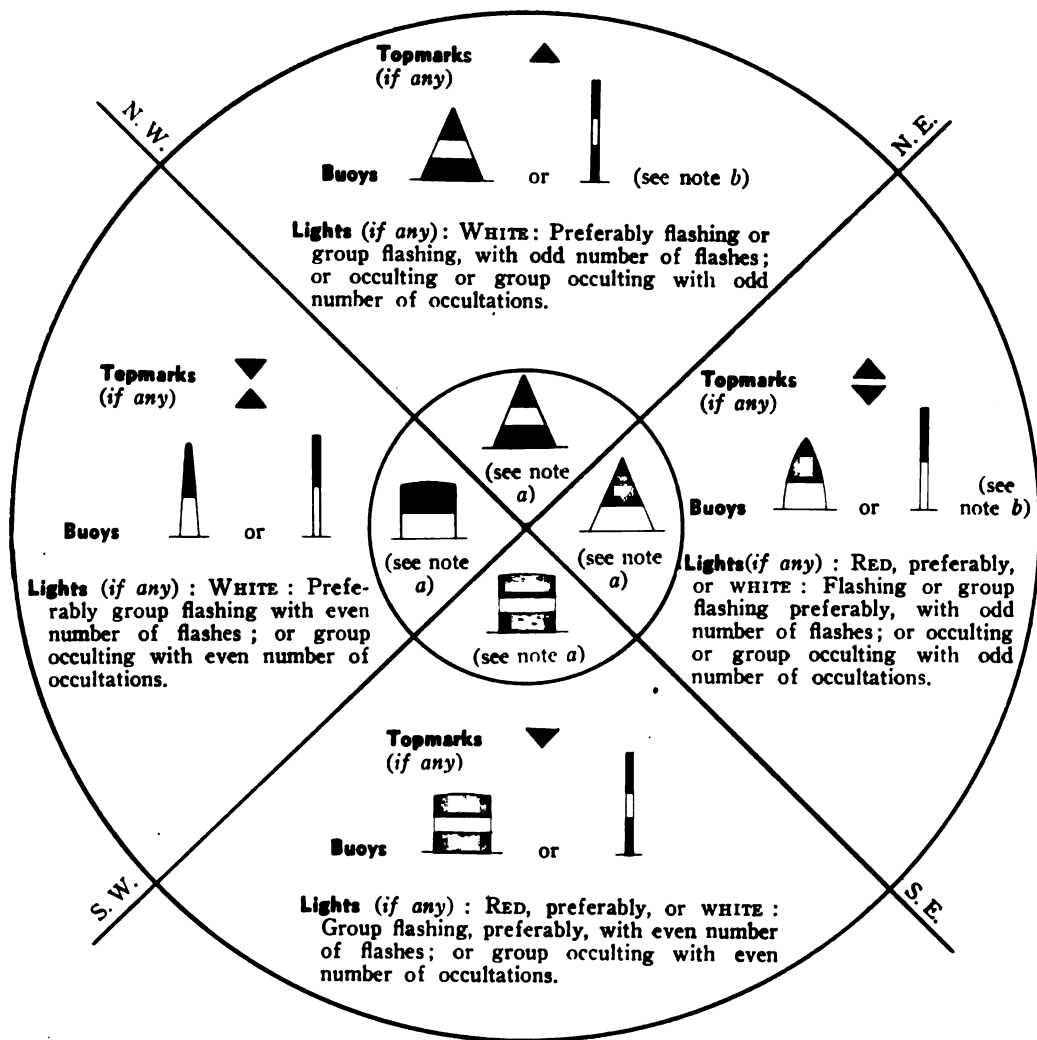
MIDDLE GROUNDS



UNIFORM SYSTEM OF MARITIME BUOYAGE

CARDINAL SYSTEM

DANGER MARKING



Note (a)

The number of characteristic shapes employed for the body of the mark may, if desired, be limited to two, the conical shape being employed in the northern and eastern quadrants, and the cylindrical shape in the southern and western quadrants.

Note (b)












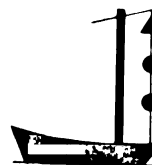
When spars only are used, it may be advantageous in the northern and eastern quadrants to reverse the position of the dark colors; in this case the colors will be:-



UNIFORM SYSTEM OF MARITIME BUOYAGE









WRECK MARKING

(Lateral System)

		To be passed on the port hand	To be passed on either hand	To be passed on the starboard hand
Buoys	Topmarks			
	Buoys	 or  with "W" in white	 or  with "W" in white	 or  with "W" in white
	Lights	GREEN, group flashing (2)	GREEN, single occulting	GREEN, group flashing (3)
Vessels	By day	 with "WRECK" or "W" in white	 with "WRECK" or "W" in white	 with "WRECK" or "W" in white
	By night	Two GREEN fixed lights in lieu of shapes	Four GREEN fixed lights in lieu of shapes	Three GREEN fixed lights in lieu of shapes
	Bell	Two strokes	Four strokes	Three strokes

WRECK MARKING

(Cardinal System)




Topmarks		
Buoys	 or  or  with "W" in white	 or  or  with "W" in white
Lights:	GREEN, quick flashing.	Lights (if any): GREEN, inter- rupted quick flashing.



UNIFORM SYSTEM OF MARITIME BUOYAGE

MISCELLANEOUS

(Common to both systems)



Isolated Dangers

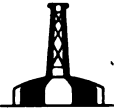

Topmarks  or  or 
(if any)

Buoys  or 

Lights
(if any) WHITE or RED, rhythmic



Fairways



 or 
(shape optional)

 or 
(shape optional)

Rhythmic

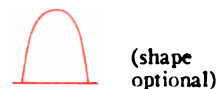
Transition marks

Topmarks
(if any)  (shape optional) or 


 or 
(shape optional)

Buoys

Quarantine grounds

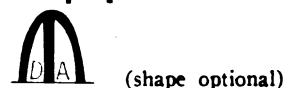


Outfall and Spoil-grounds

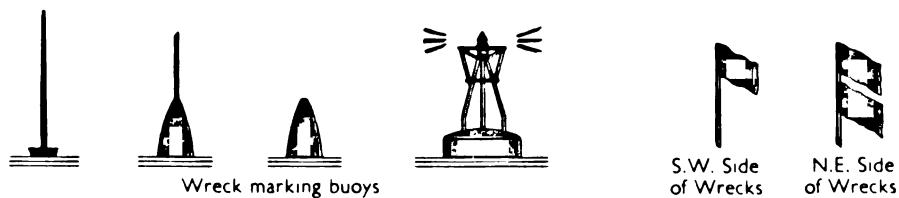
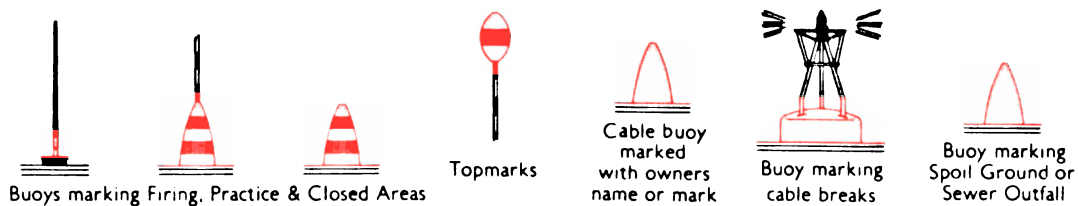
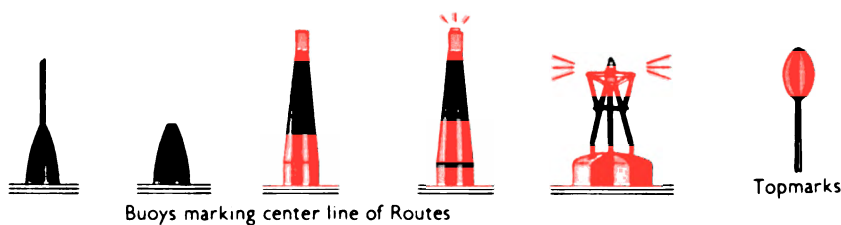
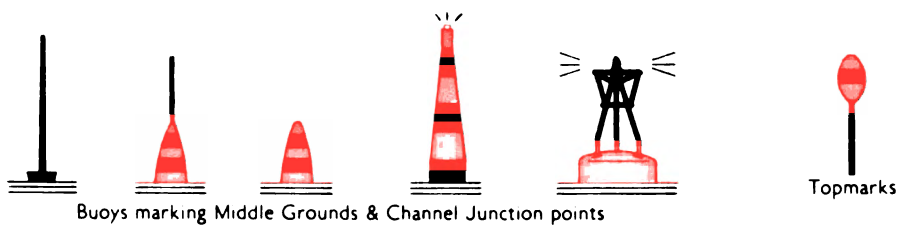
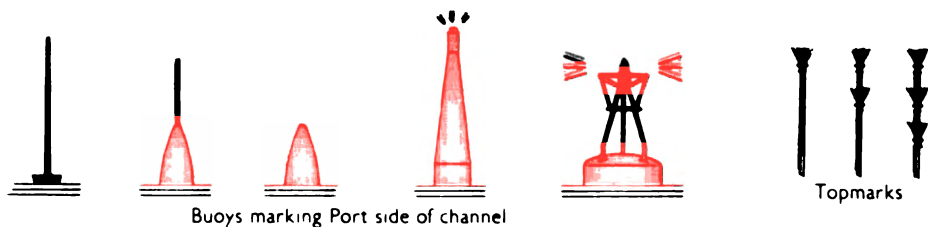
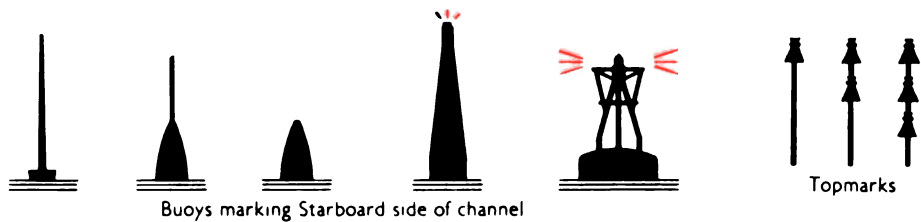
Buoys  (shape optional)

Lights Differing from neighboring lights.

Areas used for Naval, Military or Air Force practice purposes

























DANISH BUOYAGE SYSTEM



GERMAN BUOYAGE

LATERAL SYSTEM OF MARKING FAIRWAYS

APPROACHES	  		
APPROACH BUOYS	 		
FAIRWAYS	 		
CHANNEL BUOYS	     		
MIDDLE GROUNDS	  		
BIFURCATION BUOYS	  		
CONJUNCTIONAL BUOYS	  		

(continued on facing page)

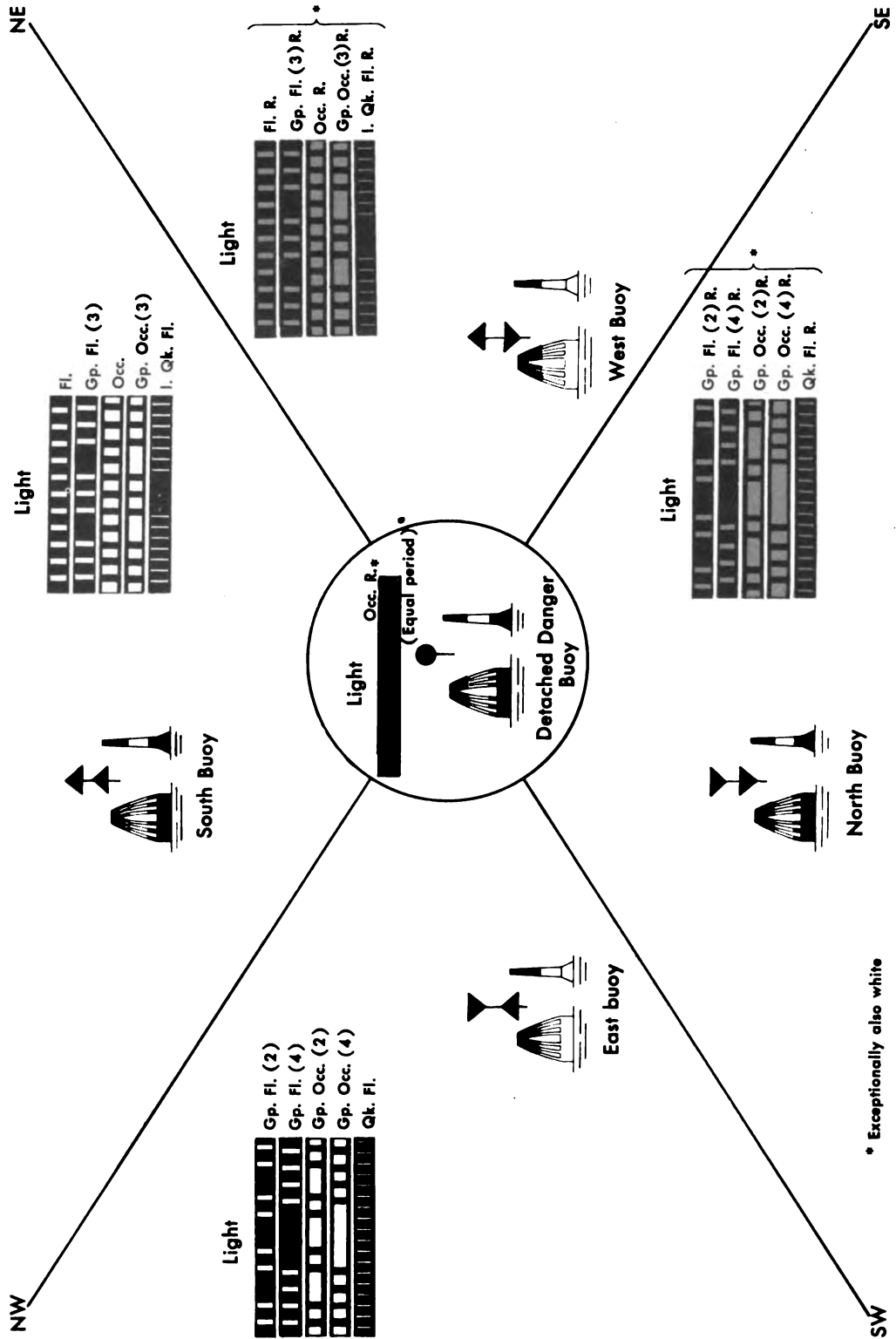
GERMAN BUOYAGE

LATERAL SYSTEM OF MARKING FAIRWAYS | (CONTINUED)

ENTRANCES OF BRANCHING CHANNELS	(■) (■)	(●)	(▲)	(▲)	
	Left Side of Entrance Branching Channel on Left Side of Main Channel	Right Side of Entrance Branching Channel on Right Side of Main Channel	Right Side of Main Channel and Left Side of Branching Channel Both Channels of Equal Importance	Left Side of Entrance Branching Channel on Right Side of Main Channel	
LIGHTING OF BUOYAGE	<div><div><div>F. R.</div><div>Gp. Occ. (2)</div><div>Gp. Occ. (4)</div><div>Gp. Fl. (2)</div><div>Gp. Fl. (4)</div><div>Qk. Fl. *</div></div><div>Port Side</div></div> <div><div><div>Occ. (Equal period)</div></div><div>In the Channel — Passage Possible on Both Sides</div></div> <div><div><div>Fl. R.</div><div>Occ. R.</div></div><div>Middle of the Channel</div></div> <div><div><div>F. G.</div><div>Occ.</div><div>Gp. Occ. (3)</div><div>Fl.</div><div>Gp. Fl. (3)</div><div>I. Qk. Fl. *</div></div><div>Starboard Side</div></div>				
	SMALL REEFS OR SHOALS IN THE CHANNEL	(●)		NOTE	
		Light	<div><div>Occ. R.</div><div>(Equal period)</div></div>	Starboard hand markers are designated with large Latin letters.	
May be Passed on Either Side			Port hand markers are indicated by Arabic numerals.		
			Intermediate buoys are designated on the starboard side by a number in addition to the letter, and on the port side by a small letter in addition to the number.		

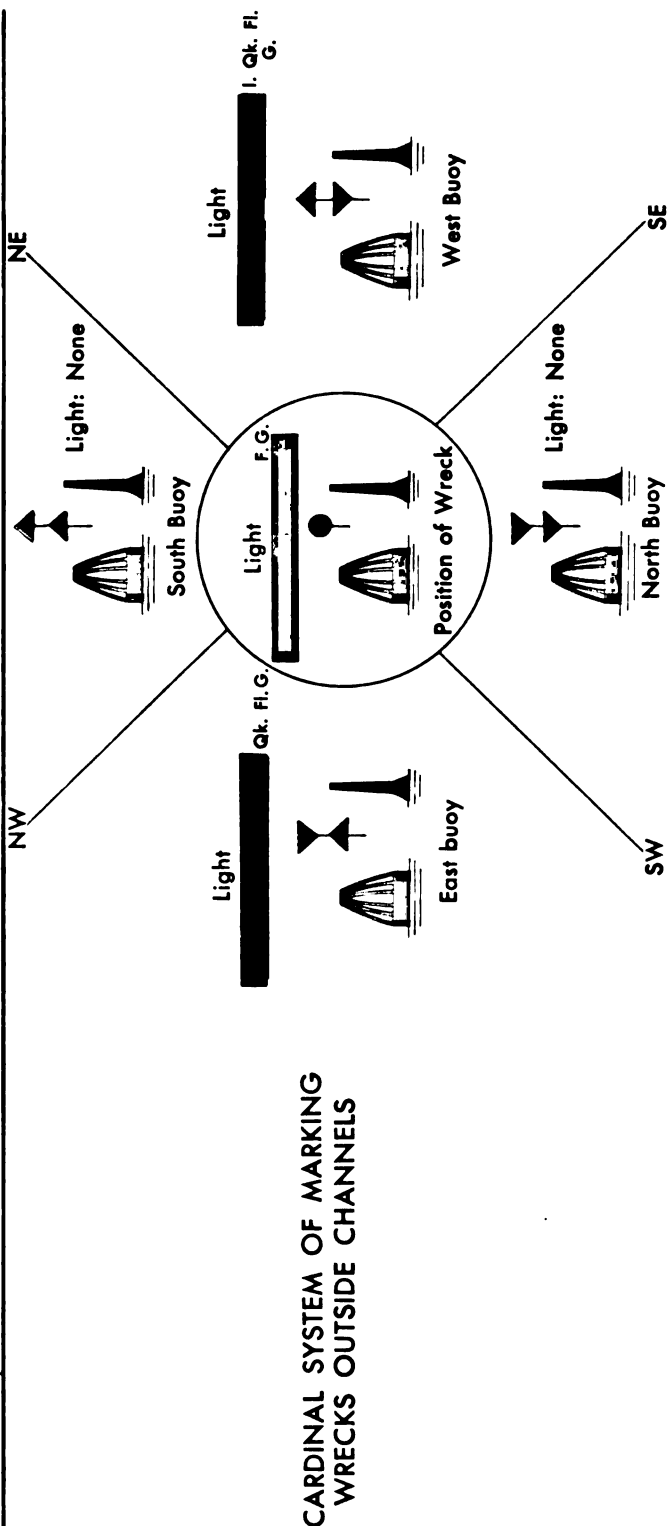
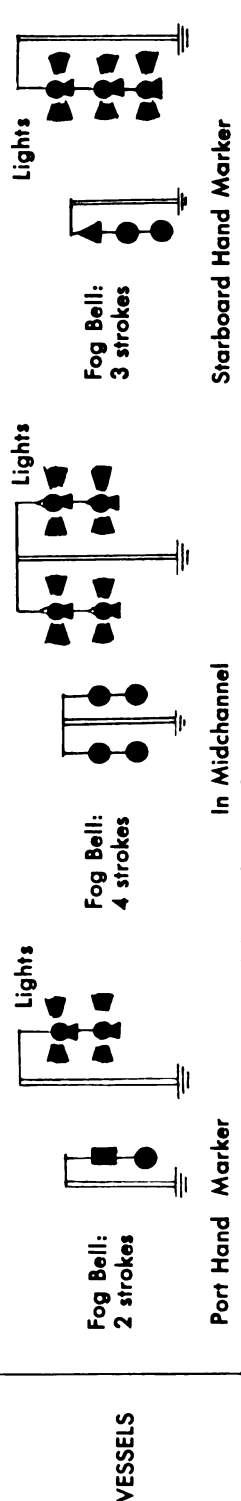
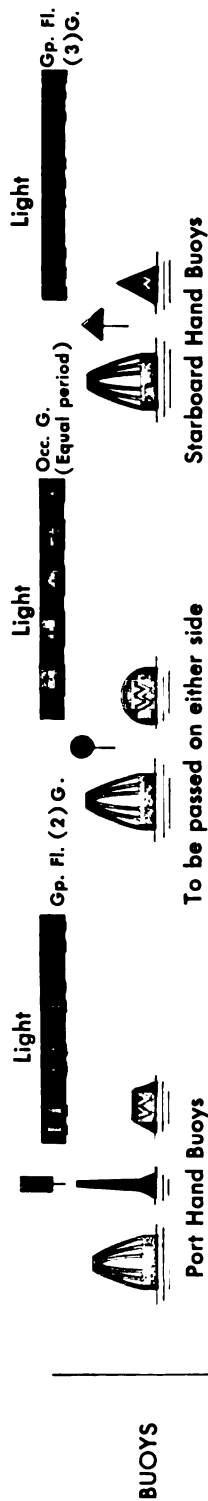
GERMAN BUOYAGE

CARDINAL SYSTEM OF MARKING NATURAL DANGERS



GERMAN BUOYAGE

LATERAL SYSTEM OF MARKING WRECKS IN CHANNELS



GERMAN BUOYAGE

MISCELLANEOUS MARKERS

SUBMARINE CABLES
AND PIPELINES



Shore Marker



Range Beacons



Buoy

QUARANTINE ANCHORAGES



Or any other shape

SPOIL GROUNDS



Or any other shape

EXPLOSIVE ANCHORAGES

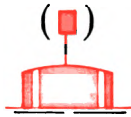


PROHIBITED AREAS



Or any other shape

ROADSTEAD LIMITS



On port side of
adjacent channel



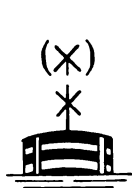
On starboard side
of adjacent channel

FISHING AREAS

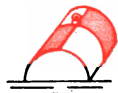


Or any
other shape

MEASURED DISTANCES



MOORING BUOYS



COMPASS ADJUSTMENT BUOY



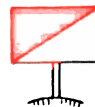
Or any other shape

RACING GROUNDS

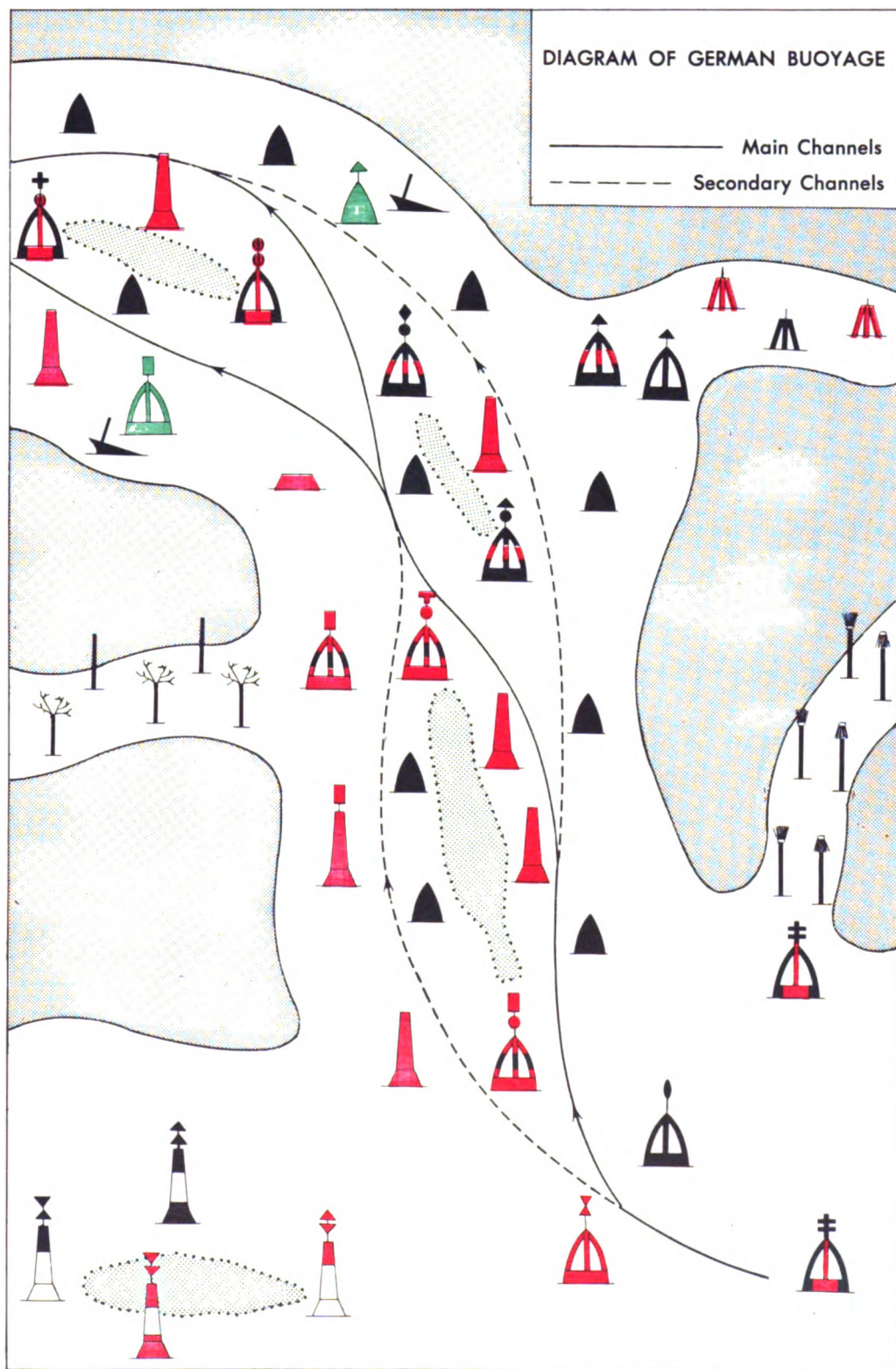


FERRY LANDINGS

Shore Marker



* Optional Topmarks are indicated by parenthesis.



VII-RECORD: RECORD OF CHANGES TO H.O. PUB. NO. 42 (Chg. 2)

VIII-RECORD: RECORD OF NOTICES TO MARINERS APPLIED TO H.O. PUB. NO. 42 (Chg. 2)

XIII-2 (graphic): graphic Office Publication No. 42 (formerly No. 141B); as originally published it is corrected to March 22, 1958 (Chg. 2)

XIV-25 (cations): cations Nos. 117 and 118 (formerly Nos. 205 and 206, respectively) should be consulted. (Chg. 2)

3-L-20 (No. 141A): No. 41. (Chg. 2)

• 23-R-30 (given): given in H.O. Pub. No. 118 (Radio Weather (Chg. 3)

• 75-L-6 (side): side is marked by a red conical lighted buoy. (Chg. 3)

83-R-29 thru 34 (A submarine):

A submarine cable is laid between the western side of Romsø and Hindsholm. Beacons mark the landing places. (Chg. 1)

84-L-43 thru 44 (or): or three years. In 1960 the depth in the channel was about $14\frac{1}{4}$ feet. A warping buoy is (Chg. 2)

• 86-R-8 (Halsskov): Halsskov Rev is marked by a can buoy, with a radar reflector, moored (Chg. 3)

• 88-R-18 (ward) After line 18 add:

A dangerous wreck lies sunk in the fairway about 2 miles east-southeastward of the lighthouse on Sprogø. (Chg. 3)

88-R-35 (nel): nel are from 7 to $16\frac{1}{4}$ fathoms. A light buoy is moored in the eastern approach to the channel about $2\frac{1}{4}$ miles southward of Sprogø Light. (Chg. 2)

• 90-R-14 (south-): south-southeastward of Sprogø. An unmarked wreck lies in $6\frac{1}{4}$ fathoms about $2\frac{1}{4}$ miles southeastward of the southern end of Omø Island. (Chg. 3)

96-R-18 (southeastward): southeastward of Avernakke Pynt. A 1-foot patch lies about 175 yards farther southeastward. (Chg. 2)

96-R-35 (shown): After line 35 add:

A lighted whistle buoy is moored at the entrance of Nyborg Fjord about 1 mile southeastward of Slipshavn Light. (Chg. 2)

98-L-34 (necting): necting the causeway with the mole. A dolphin (Chg. 2)

• 101-R-13 (eastward): eastward of Lille Hov. Three light buoys lie $3\frac{1}{4}$ miles northeastward, $4\frac{1}{4}$ miles north-northeastward, and $7\frac{1}{4}$ miles north-northeastward, respectively, of Lille Hov. (Chg. 3)

105-R-3 (with): with rocks in some places. The western edge of Albue Flak is marked by a white can buoy with a topmark of three upturned brooms. (Chg. 2)

• 106-R-27 (a southbound): After line 27 add:

Caution.—Vessels transiting Langelands Bælt should observe the prohibited and danger areas, described in sections 3D-10 and 5A-8, which lie in the southern approach to this channel. (Chg. 3)

- 107-L-12 (east-southeastward): east-southeastward of Rommersholm. A 490-foot pier extends from the eastern side of Enehøje and small piers extend from Slotø and Vejlsø. Four (Chg. 2)
- 107-R-10 (northwestward): northwestward of Albuen. A lighted bell buoy is moored about 2 miles north-northwestward of Albuen. A 3-fathom patch (Chg. 2)
- 108-R-31 thru 37 (approach): approach channel to Langø Havn. (Chg. 2)
- 111-L-33 (Rudkøbing): Rudkøbing Løb has a least depth of $16\frac{1}{2}$ feet from (Chg. 2)
- 117-L-18 thru 21 (2D-10):
2D-10 Piers.—Grasten Pier, close northward of the (Chg. 2)
- 120-L-40 (a depth): a depth of $15\frac{1}{2}$ feet alongside. (Chg. 2)
- 120-L-60 thru 62 ($308\frac{1}{2}$): 375 feet; breadth at entrance, 63 feet; depth on sill at mean high water springs, 18.5 feet; lifting power 3,500 tons. The most powerful of several cranes in (Chg. 3)
- 120-R-13 (Depths):
Depths: Rudkøbing Løb, northern part, $16\frac{1}{2}$ feet. (Chg. 2)
- 127-R-8 (a least): a least depth of $24\frac{1}{2}$ feet leads from the entrance (Chg. 2)
- 130-R-30 (H.O.): H.O. Pub. 41 (Chg. 2)
- 131-L-11 (Pub.): Pub. 41. Those between Fyns Hoved and (Chg. 2)
- 133-L-19 (Berths): Berths, 13 to $24\frac{1}{2}$ feet. (Chg. 2)
- 134-L-40 thru 42 (boards.): boards. Two overhead cables, with a vertical clearance of 148 feet and 174 feet, span the canal about 1 mile and $1\frac{1}{4}$ miles, respectively, within the canal entrance. (Chg. 3)
- 142-L-33 (Strib.): Strib, and at (Chg. 2)
- 142-R-1 (by): by beacons. The beacons on the Fredericia side are lighted at night. A submarine cable, also marked (Chg. 2)
- 142-R-39 ($\frac{1}{4}$ mile): $\frac{1}{4}$ mile from Skanseodde. A sewer outfall marked by a buoy discharges about 400 yards east-southeastward of Skanseodde. (Chg. 2)
- 151-L-8 (that): that stand in the harbor. Lighted buoys mark the outer reach of the channel and include a red and white striped buoy $\frac{1}{4}$ mile southward of Drejens Odde. Lights are also shown (Chg. 3)
- 151-L-10 thru 12 (The town):
The town stands out prominently. Julemærke Sanatorium is located on the north shore nearly 1 mile westward of (Chg. 2)
- 151-R-3 (apply): apply to navigation in Kolding Fjord, with the (Chg. 2)
- 154-R-5 (with): with poles. There are several tileworks (Chg. 2)
- 154-R-7 (tile): tile works close southward of the (Chg. 2)
- 155-L-32 (the island): After line 32 add:
A dangerous wreck, marked by a lighted buoy, lies sunk on the edge of the channel about $1\frac{1}{4}$ miles southeastward of Baagø Light. (Chg. 3)

- 156-L-23 thru 25 (of Assens): of Assens and is small and flat. Beacons on the islet indicate the landing places of three submarine cables laid to the coast of (Chg. 3)
- 161-L-18 (mile): mile and about $\frac{1}{4}$ mile eastward of the harbor entrance. The (Chg. 2)
- 163-R-29 (reef): reef that lies on a small 4-fathom bank in a posi- (Chg. 2)
- 163-R-34 thru 35 (of): of 6 fathoms on the west side of a 28-foot patch close westward of Hesteskoen. There is a channel with depths of $6\frac{1}{2}$ (Chg. 2)
- 164-L-20 thru 22 (A wreck):
A wreck with a depth of $9\frac{1}{4}$ fathoms lies about $1\frac{1}{4}$ miles northwestward of Skjoldnæs (sec. 3D-10). (Chg. 2)
- 165-R-26 (shore): shore. A buoy moored about $\frac{2}{3}$ mile north- (Chg. 2)
- 166-R-23 (certain): certain directions at sea. Lyo Light is shown from the northern extremity of the island. (Chg. 2)
- 170-L-45 thru 46 (its outer): its outer end by a light buoy with a radar reflector moored in a depth of about 5 fathoms. Light buoys mark the passage through the fjord to Als Sund. (Chg. 3)
- 173-R-36 ($\frac{1}{2}$ mile): $\frac{1}{4}$ mile eastward from the point. A pier with (Chg. 2)
- 174-R-5 (west) After line 5 add:
The fairway of the channel which lies between Skrams Flak and the shorebank off the west and northwest sides of Avernakø is marked by three buoys with radar reflectors. (Chg. 2)
- 175-L-34 (of): of the fjord and has a least depth of $17\frac{1}{4}$ feet (Chg. 2)
- 175-R-28 (westward): westward of the light. A buoy, with a topmark of two upturned brooms, is moored about $\frac{1}{2}$ mile southwestward of the light. (Chg. 3)
- 176-L-27 (and has): and has a few low green cliffs. A firing area is located in the western part of Hanse Bugt and extends about 1 mile southeastward of the southeastern end of Bjørnø. (Chg. 1)
- 181-L-38 (A buoy): A buoy with a radar reflector is moored in a depth of 19 feet at the (Chg. 3)
- 182-L-31 thru 38 (Hoved.): Hoved. In 1960 the inlet was closed and the navigational aids removed. (Chg. 3)
- 183-L-4 thru 6 (Klørdyb):
Klørdyb is normally about $7\frac{1}{4}$ feet deep but is subject to silting. The entrance to this (Chg. 2)
- 184-R-29 thru 31 (Buoys): A buoy is also moored about $\frac{2}{3}$ mile eastward of the pierhead on Strynø. These three buoys indicate the (Chg. 2)
- 185-R-5 (of): of the town there is a pier with a depth of 8 (Chg. 2)
- 185-R-7 (a depth): a depth of 8 feet over a width of about 40 (Chg. 2)
- 193-L-15 (with): with a least depth of 1 fathom, lies about $1\frac{1}{4}$ (Chg. 2)
- 194-R-22 thru 24 (northward): northward of this patch. A submarine cable, marked by buoys at each end, is laid along the northeastern side of Kalkgrund.
A former ammunition dumping ground, triangular shaped, (Chg. 3)
- 194-R-34 thru 35 (a signal): a signal station aboard the lightship. (Chg. 2)
- 195-R-38 thru 40 (miles): miles northwestward of Borreshoved, is a prominent landmark.
Broager (Chg. 2)

196-L-10 thru 12 (Høruphav): Høruphav, located on the opposite shore. Submarine cables, marked by a beacon on Kegnæs, cross the inlet in the vicinity of the (Chg. 2)

201-L-10 (A wreck):

A wreck with a depth of $6\frac{1}{2}$ fathoms lies about (Chg. 2)

201-L-13 (28 feet): 27 feet lie in an area about $\frac{1}{4}$ mile north-north- (Chg. 2)

202-L-20 (Berths): Berths, 13 to 23 feet. (Chg. 2)

• 205-L-14 thru 15 (take): take ship repairs, and a floating drydock with a capacity of about 1,500 tons. A diver with equipment is (Chg. 3)

• 206-R-29 thru 32 (A former): Delete. (Chg. 3)

• 211-L-21 (buoys): buoys, two on each side of the fairway, with the southern pair of buoys having radar reflectors. The (Chg. 3)

• 211-L-25 (Nienhof) After line 25 add:

A submarine cable is laid from Stollergrund Rinne generally northeastward to the southern part of Langeland (sec. 3D-10). (Chg. 3)

211-R-1 (buoy): buoy with a radar reflector is moored close seaward of this curve. (Chg. 1)

212-R-9 (For): For pilot signals, see H.O. Pub. No. 36, East- (Chg. 2)

• 213-L-1 thru 2 (nearly): nearly 2 miles northeastward of Bülk. (Chg. 3)

213-L-6 thru 7 (An ammunition):

A former ammunition dumping ground lies within about $2\frac{1}{2}$ miles of the (Chg. 2)

• 213-R-39 (Navigational):

Navigational aids.—A lighted bell buoy with a radar reflector, (Chg. 3)

• 214-L-12 (by): by lighted and unlighted buoys, several with radar reflectors. In the vicin- (Chg. 3)

• 214-L-40 thru 43 (There): Delete. (Chg. 3)

• 216-R-34 thru 35 (east): east by Scheermole which extends south-southeastward (Chg. 3)

• 216-R-36 (from the): from the head of Südmole. A light is shown on the head of Scheermole. Tirpitzmole, ex- (Chg. 3)

• 216-R-44 thru 45 (of the): of the harbor. (Chg. 3)

• 218-R-54 (and the): and the remainder is used by barges. Tirpitzmole is about 738 feet long, with depths of 32 to 39 feet alongside. (Chg. 3)

• 225-L-43 (Harbor) After line 43 add:

In 1961 a bridge was under construction from the vicinity of Fehmarnsund Ferry Harbor to the mainland southward. The works area is marked by lights and buoys. (Chg. 3)

• 225-R-8 (senbrode): senbrode Church will come into view. A silo, 131 feet high, stands near the Petersdorf Church. (Chg. 3)

227-Graphic Index-Chapter 5: Change "General Chart H.O. 4845" to "General Chart 4844".
(Chg. 2)

- 232-R-31 (this) After line 31 add:
Puttgarden Harbor, located about $\frac{1}{4}$ mile westward of Ohlenburgs Huk, has an east and west mole. A light is shown on the head of each mole. (Chg. 3)
- 232-R-39 (5A-2): 5A-2. A beacon, used by the Fehmarnbelt Lightship to maintain position, stands on the coast about $1\frac{1}{2}$ (Chg. 2)
- 233-L-7 (the boat) After line 7 add:
In 1961 a ferry harbor was under construction about $\frac{1}{4}$ mile northward of Marienleuchte Lighthouse. The works are marked by lights and buoys. (Chg. 3)
- 233-R-5 (Prohibited):
Danger area.—A danger area about (Chg. 3)
- 238-L-38 (fathom): fathom curves. Lighted buoys "1" and "5", painted red and white, are moored 1 mile northward and 6 miles eastward, respectively, of Sagas Bank. (Chg. 3)
- 238-R-28 (A pair): A pair of lights in range $356\frac{1}{2}^{\circ}$ is shown in the (Chg. 2)
- 239-L-17 (breakwater) After line 17 add:
An area close off the ferry harbor is designated a ferry turning basin. Vessels should exercise caution and conform to the existing traffic regulations. (Chg. 3)
- 240-L-44 (outer): outer part of the channel. A wreck, with a depth of $7\frac{1}{2}$ fathoms over it, marked by a buoy, lies $\frac{1}{2}$ mile westward of Neustadt fairway buoy. The fairway buoy, (Chg. 3)
- 243-L-38 (railways): railways. Minor repairs can be effected. A crane with a capacity of 25 tons is available. (Chg. 3)
- 243-R-15 (of 163): of 174 feet crosses the river at Schlutup and a second overhead cable with a clearance of about 155 feet spans the river about $2\frac{1}{2}$ miles above Schlutup. (Chg. 3)
- 247-R-14 thru 16 (with): with navigational aids. In 1961 the channel to the port had a depth of $29\frac{1}{4}$ feet and vessels of 27-foot draft could enter the harbor. Ships up to 22,000 tons capacity with a draft of $26\frac{1}{4}$ feet have entered the harbor. (Chg. 3)
- 248-L-7 (nel): nel there is a depth of $29\frac{1}{4}$ feet (1961). (Chg. 3)
- 254-R-18 (curve): curve. Warnemünde Lighted Bell Buoy, with a radar reflector, the (Chg. 3)
- 260-R-7 (Wustrow) After line 7 add:
Prohibited anchorage.—Anchorage is prohibited in an area, about 3 miles wide at its outer end, that extends about 6 miles westward from Darsser Ort. (Chg. 2)
- 261-Graphic Index-Chapter 6: Change "General Charts H.O. 4845 and B.A. 2150" to "General Chart H.O. 4844". (Chg. 2)
- 261-Graphic Index-Chapter 6: Change "(See H.O. Pub. No. 142)" to "(See H.O. Pub. No. 43)". (Chg. 2)
- 273-R-9 thru 10 (major): major repairs. There is a drydock capable of lifting vessels up to 3,000 dead weight tons and a marine railway with a capacity of about 1,000 (Chg. 3)
- 275-Graphic Index-Chapter 7: Change "General Chart H.O. 4845" to "General Chart H.O. 4844". (Chg. 2)
- 275-Graphic Index-Chapter 7: Change "(SEE H.O. PUB. NO. 141A)" to "(SEE H.O. PUB. NO. 41)". (Chg. 2)

- 283-R-11 (ish): ish uniform system, is $14\frac{1}{4}$ feet. Except in (Chg. 2)
- 283-R-44 (in): in 1960 and an inner harbor with depths of $6\frac{1}{2}$ (Chg. 2)
- 284-L-20 thru 21 (depths): depths alongside of $6\frac{1}{2}$ to $9\frac{1}{2}$ feet. A tug is (Chg. 2)
- 284-L-35 (1953): 1960 there was a depth of 9 feet in the entrance (Chg. 2)
- 285-L-8 (A wreck):
An unmarked wreck with a depth of $6\frac{1}{4}$ fathoms lies about (Chg. 3)
- 287-L-3 (of): of Knudshoved. A buoy is moored in a (Chg. 2)
- 289-R-31 thru 33 (central): central shoal area is marked by two conical buoys moored about $1\frac{1}{2}$ miles southwestward and $3\frac{2}{3}$ (Chg. 3)
- 292-L-7 thru 8 (Tidal): Berths at Næstved, $6\frac{1}{2}$ to $19\frac{1}{2}$ feet.
Tidal range: About 1 foot. (Chg. 2)
- 292-R-21 (depth): depth of $19\frac{1}{2}$ feet in 1960. For about 200 yards (Chg. 2)
- 294-L-9 (ceived): ceived a vessel must keep at least 765 yards from (Chg. 2)
- 299-R-1 thru 3 (A submarine): Two submarine cables are laid between the southern side of Vejro and Skalo and Fejo, respectively. Range beacons mark the landing places of the eastern cable. (Chg. 1)
- 300-R-9 thru 11 (ficial): ficial harbor. There is a depth of $9\frac{1}{4}$ feet in the approach channel, the same depth being found on the western side of the harbor and at the ferry (Chg. 2)
- 301-R-37 (10 feet): $9\frac{1}{4}$ feet in 1960. The water level may be raised (Chg. 2)
- 302-L-35 (Nakke): Nakke and is marked by a light buoy moored (Chg. 2)
- 306-L-3 (oms): oms. A pier with a depth of 12 feet at its (Chg. 2)
- 307-L-23 (pair): pair of lighted range beacons, the northern being on (Chg. 3)
- 307-L-25 (side): side. A submarine cable crosses the channel about 2 miles northwestward of Hjelms Nakke. (Chg. 1)
- 309-L-3 (Fakse): Fakse Bugt (see H.O. Pub. No. 41). The (Chg. 2)
- 309-R-38 (southern): southern passage and to Hestehoved Dyb; through the western part of (Chg. 2)
- 310-L-2 thru 3 (Pilots):
A pilot for the northeastern entrance of the northern passage is stationed on Nyord. A (Chg. 2)
- 310-L-26 thru 27 (tric): tric power plant with two conspicuous chimneys. (Chg. 2)
- 313-R-42 thru 43 (A submarine):
Submarine cables are laid between Bogø and Farø; they are marked at each landing place by a (Chg. 2)
- 314-R-7 (Tæro): Tæro, has a depth of $7\frac{1}{2}$ feet at its head. (Chg. 2)
- 317-L-6 (channel): channel is narrow and winding with a least bottom width of about 165 feet, and it is (Chg. 2)

317-L-9 (a least): a least depth of 8 feet at mean water level. (Chg. 2)

317-L-27 (Pilots):

A pilot for Bøgestrøm is stationed at Nyord (Chg. 2)

319-L-15 (hoved): hoved Havn, and its southeastern part is sep- (Chg. 2)

320-L-37 (There): There is a depth of $8\frac{1}{2}$ feet in the channel and (Chg. 2)

324-R-36 (Masnsedø):

Masnedø Øster Flak.—See section 7C-14. (Chg. 2)

339-R-7 (— — (Store Bælt) After line 7 add:

Asnæsværkets Havn -----2A-8 (Chg. 2)

* 340-L-15 (Blans Havn): Delete. (Chg. 3)

* 341-L-47 (Deratization): Deratting, Denmark -----1-7 (Chg. 3)

345-R-21 (— Sjælland) After line 21 add:

— Færgehavn -----2A-13 (Chg. 2)

345-R-23 (— Mole): Delete. (Chg. 2)

346-R-20 (Løb): Løb, Nordre -----7C-10 (Chg. 2)

348-R-3 (Pelzerhaken) After line 3 add:

Petersdorf -----5D-11 (Chg. 2)

* 349-R-41 (—, supplementary) After line 41 add:

—, U.S. aircraft and merchant vessel distress assistance procedures -----1-36 (Chg. 3)

352-L-19 (Valdemarsslot): Delete. (Chg. 2)

NOTE: Change H.O. 141B to H.O. 42 at the bottom of each page. (Chg. 2)

203,22142 958 CR.2

H. O. 42 Chg. No. 2

May 6, 1961

CHANGE NO. 2 TO H. O. PUB. NO. 42
SAILING DIRECTIONS FOR
THE BALTIC VOL. I

FIRST EDITION, 1958
(Formerly No. 141B)



To correct this publication, the following changes must be applied:

No. 2

Published by the U. S. ^{1 2}Navy Hydrographic Office under the authority of the Secretary of the Navy.



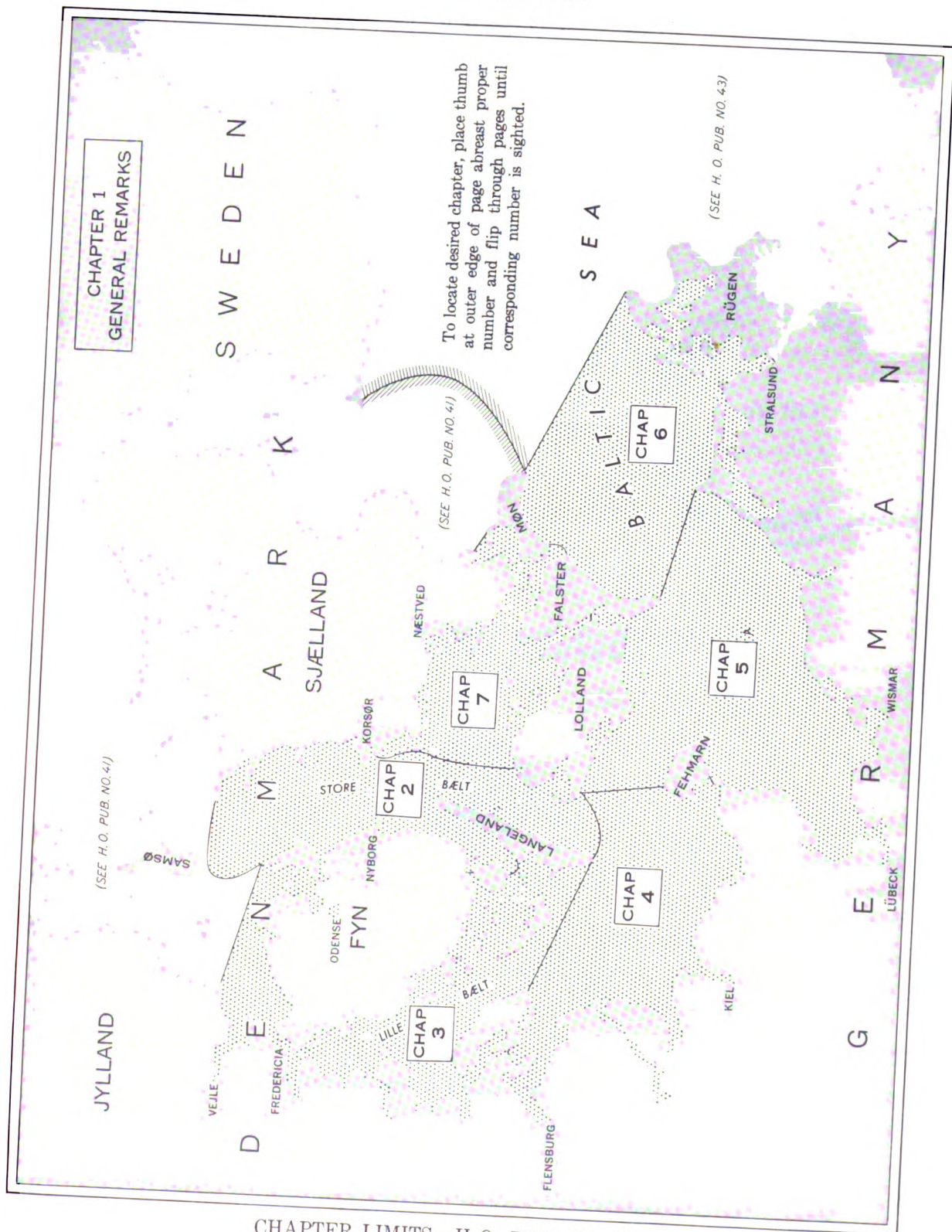
United States
Government Printing Office
Washington: 1961

For Sale by authorized Sales Agents of the U.S. Navy Hydrographic Office..... Price 35 cents.

SUGGESTED PROCEDURE FOR USING THIS CHANGE

1. Remove wire fastener.
2. Separate List of Effective Pages and Short Correction sheets from remaining Change Pages.
3. Check completeness of Change by comparing Change Pages with List of Effective Pages.
4. Using List of Effective Pages as a guide, insert each Change Page in its proper place in the book, first removing the obsolete page being replaced. Set obsolete pages temporarily aside.
5. Apply Short Corrections, if any, which are included at the end of the List of Effective Pages. Short Corrections sheets may be inserted intact immediately following the List of Effective Pages and referred to as needed, or they may be cut apart and pasted to the pages affected. Short Corrections for any given page should be kept together on a single strip. Remove the obsolete strip when the new one is applied.
6. From the obsolete pages previously set aside, transfer the Notice to Mariners dated later than the date of this Change to the corresponding replacement pages. Also remove and discard all obsolete Notices to Mariners dated prior to the date of this Change from other pages in the publication.
7. Record application of this Change to the Record Page in the front part of the book.

CHAPTER LIMITS



CHAPTER LIMITS—H.O. PUB. NO. 42

III
(Chg 2)

H. O. 42

D 803.11115
CHANGE NO.

5

AUG. 20, 1966

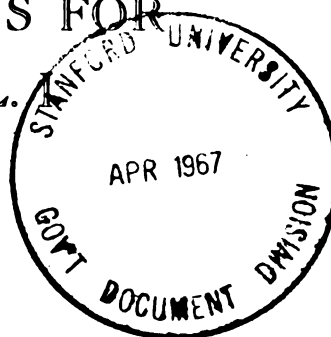
H. O. PUB. 42

FIRST EDITION, 1958

LOOSE LEAF CHANGE PAGES FOR CORRECTING

~~SAILING~~ DIRECTIONS FOR
THE BALTIC, VOL. I

(Formerly No. 141B)



Published by the U. S. Naval Oceanographic Office under
the authority of the Secretary of the Navy



For sale by authorized Sales Agents of the U. S. Naval Oceanographic Office Price 35 cents

HOW TO USE THIS CHANGE

In keeping the Sailing Directions up to date, the best practice is to apply each Change as soon as it is published, in which case the steps under part "A" are suggested. However, if Changes have not been applied singly in a timely manner, or if two or more Changes must be applied to a newly obtained book, the steps under part "B" should be followed. This latter procedure eliminates the unnecessary insertion and later removal of Change pages that have been made obsolete by the later Changes on hand. In all cases, each step should be completed before starting the next.

A. TO INSERT A SINGLE CHANGE

1. Remove wire fastener.
2. Set aside List of Effective Pages for later use. Insert remaining Change pages in book, removing obsolete pages in sequence as corresponding Change pages are inserted. Set obsolete pages temporarily aside.
3. Transfer Notice to Mariners, if any, dated later than this Change from previously removed obsolete pages to corresponding new Change pages.
4. Refer to Short Corrections in the front of the book and mark each affected book page as explained in the description of the Short Cor-

rection System. Discard Notices to Mariners, if any, dated earlier than this Change from pages affected by Short Corrections and from other book pages as necessary.

5. Verify completeness of book by comparing book pages against the List of Effective Pages previously set aside. Only listed pages belong in the book, discard all others. After verification insert the latest List of Effective Pages and discard obsolete list.

6. Update the Record Page in the front part of the book.

B. TO INSERT MORE THAN ONE CHANGE AT ONCE

1. Remove wire fastener from each Change; keep each Change separate.
2. Remove the List of Effective Pages from the latest Change.
3. Referring to the latest List of Effective Pages, remove the effective Change pages from each Change and assemble together in the order listed. Unlisted pages remaining in each Change have been made obsolete by later Changes, therefore they require no further handling.
4. Consider the assembled effective Change pages as the latest single Change and proceed as described in part "A", beginning with step 2.

D203.22: 42⁹⁵⁸ ch.6

CHANGE NO. 6 16 MAR. 1968	H. O. PUB. 42 FIRST EDITION, 1958
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A. TO INSERT A SINGLE CHANGE

1. Remove wire fastener.
2. Set aside List of Effective Pages for later use. Insert remaining Change pages in book, removing obsolete pages in sequence as corresponding Change pages are inserted. Set obsolete pages temporarily aside.
3. Transfer Notice to Mariners information, if any, dated later than this Change from previously removed obsolete pages to corresponding new Change pages. All other Notice to Mariner information, which has been superseded by the Change, should be deleted from the Chart/Publication Correction Record Cards. (NHO 5610/2).
4. Refer to Short Corrections in the front of

the book and mark each affected book page as explained in the description of the Short Correction System. Delete Notice to Mariners information, if any, dated earlier than this Change from pages affected by Short Corrections and from other book pages as necessary.

5. Verify completeness of book by comparing book pages against the List of Effective Pages previously set aside. Only listed pages belong in the book, discard all others. After verification insert the latest List of Effective Pages and discard obsolete list.

6. Update the Record Page in the front part of the book.

B. TO INSERT MORE THAN ONE CHANGE AT ONCE

1. Remove wire fastener from each Change; keep each Change separate.
2. Remove the List of Effective Pages from the latest Change.
3. Referring to the latest list of Effective Pages, remove the effective Change pages from each Change and assemble together in the order listed. Unlisted pages remaining in each Change have been made obsolete by later Changes, therefore they require no further handling.
4. Consider the assembled effective Change pages as the latest single Change and proceed as described in part "A", beginning with step 2.

D 203, 221-72^{958/ch.7}

CHANGE NO.

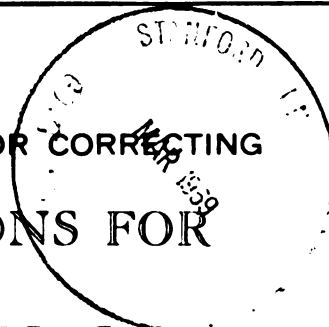
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A. TO INSERT A SINGLE CHANGE

1. Remove wire fastener.
2. Set aside List of Effective Pages for later use. Insert remaining Change pages in book, removing obsolete pages in sequence as corresponding Change pages are inserted. Set obsolete pages temporarily aside.
3. Transfer Notice to Mariners information, if any, dated later than this Change from previously removed obsolete pages to corresponding new Change pages. Delete Notice to Mariners information, if any, dated earlier than this Change from other book pages.
4. Verify completeness of book by compar-

ing book pages against the List of Effective Pages previously set aside. Only listed pages belong in the book, discard all others. After verification insert the latest List of Effective Pages and discard obsolete list.

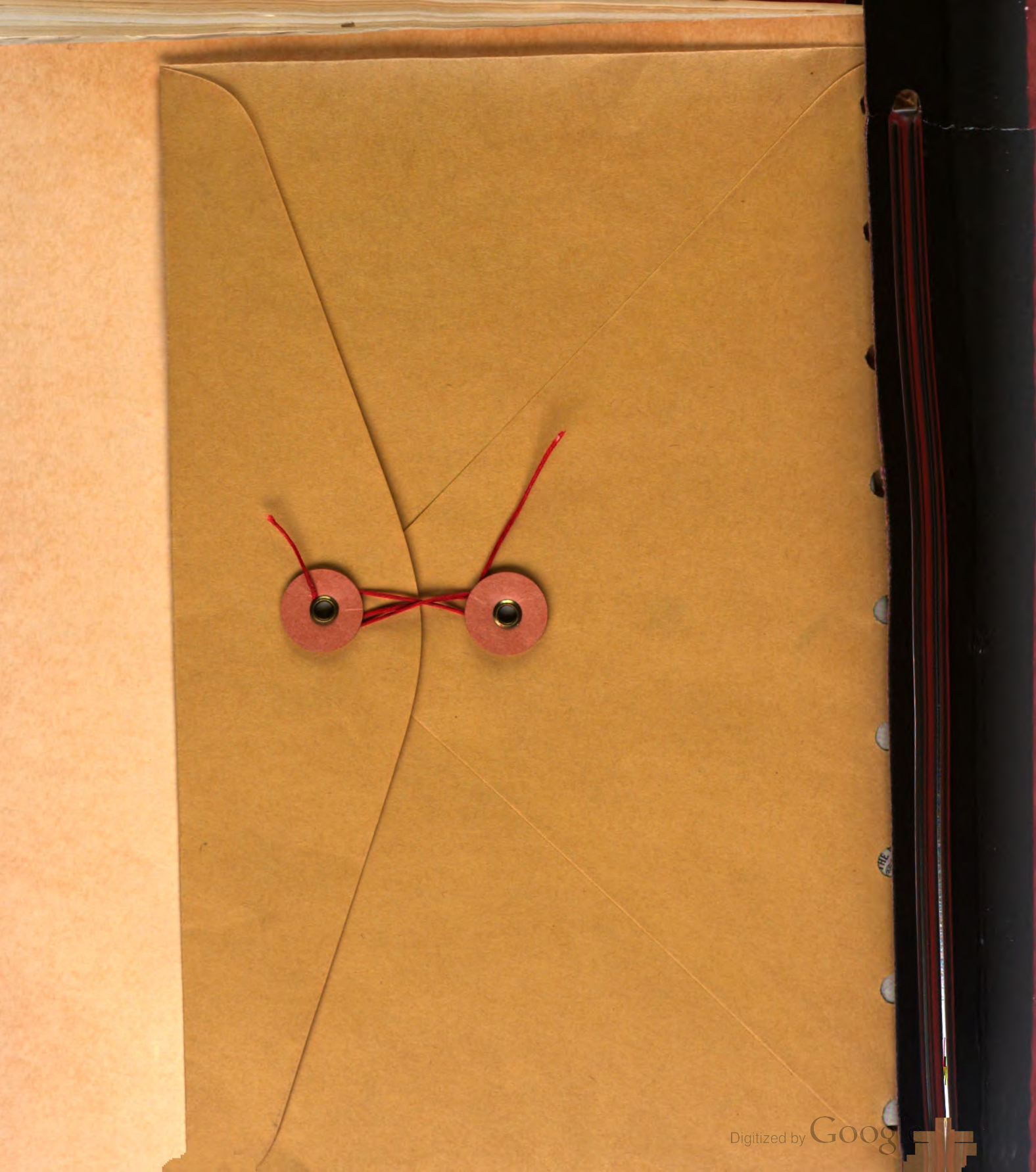
5. All Notice to Mariners information, which has been superseded by the Change, should be deleted from the Chart/Publication Correction Record Cards. (NHO 5610/2).

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